1886 Vol. XLVII FEBRUARY 15th, 1945

FLIGHT

and

AIRCRAFT ENGINEER

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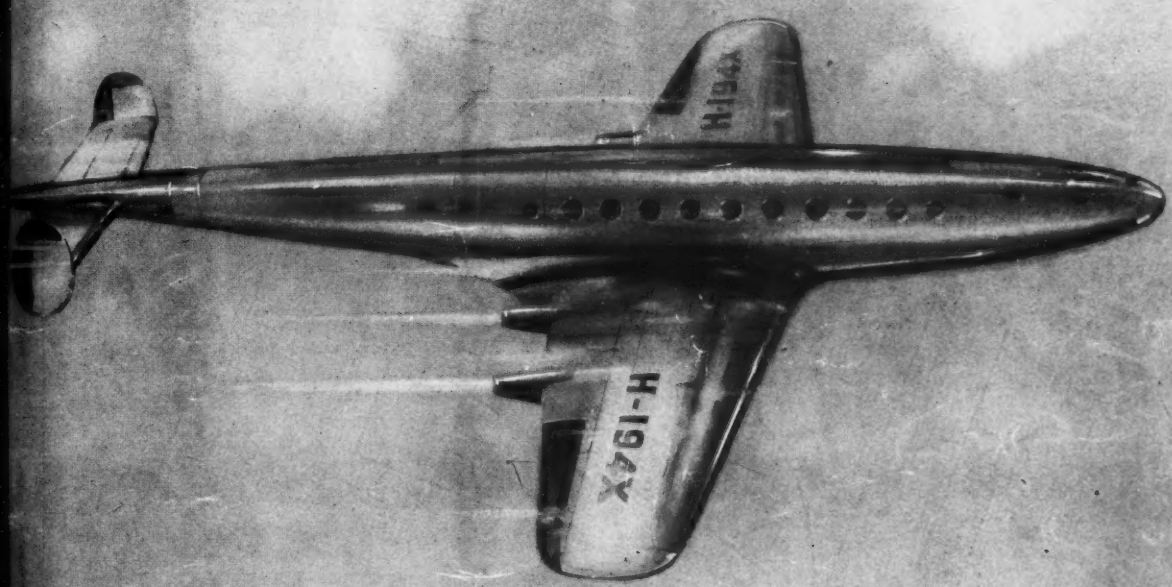

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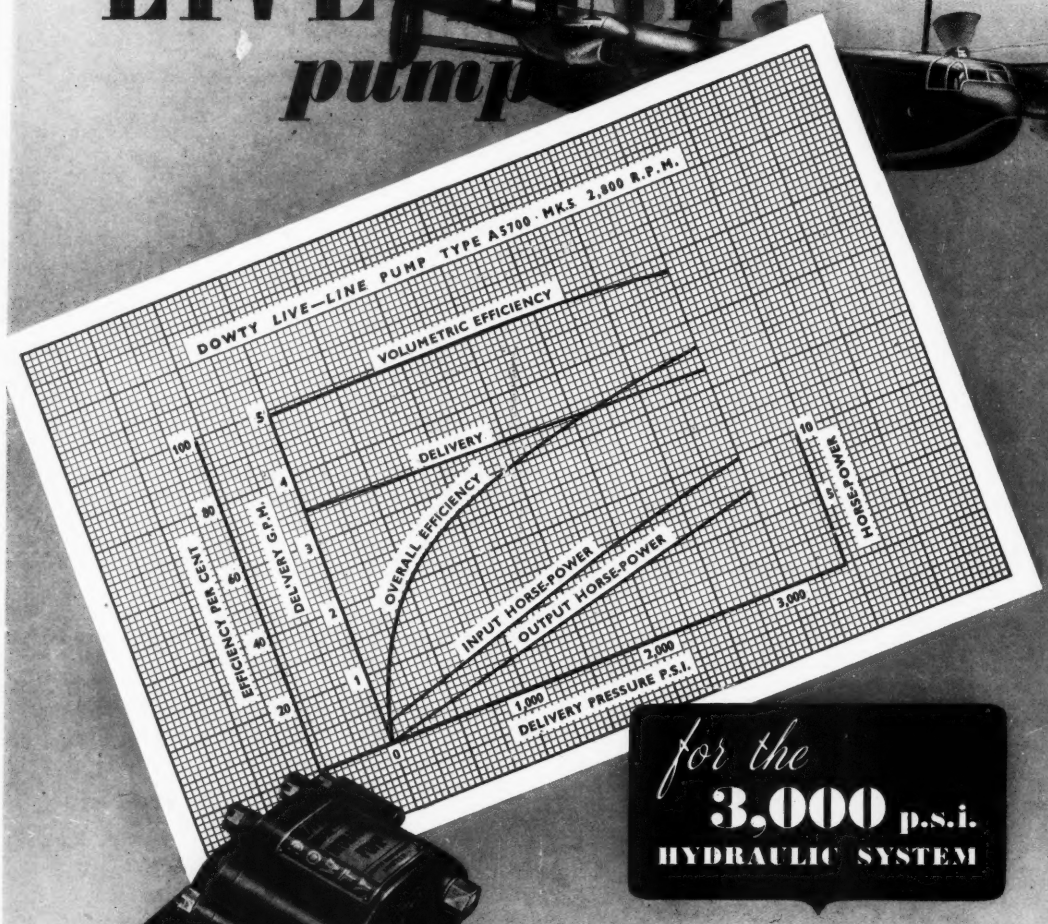

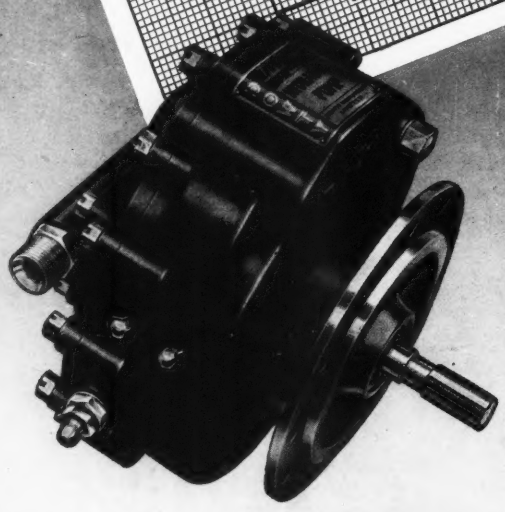

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FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Another Disbandment

THE relaxation from black-out to dim-out was the first outward and visible sign that raids on this country by German aircraft were no longer to be expected. Next comes the disbandment of the Balloon Command.

As a matter of fact, London has seen nothing of the barrage balloons since last June, when they all moved off to the area where they were thought most likely to bring down air torpedoes which had escaped the attentions of fighters and A.A. gunners. There they did bring down nearly 300 of the pests, and so finished up a very creditable career with the saving of many lives.

Most people who were in this country when war was declared will remember that the sudden appearance of hundreds of balloons over London and some other chosen spots was the first visible sign that the country was once more at war—and they will also remember how beautifully the new silver dope glittered in the sunlight during the fine autumn of 1939 and 1940. The balloons were also very useful wind vanes. Where they soared in the sky none but a few of the most reckless German pilots would venture to dive low and use their machine guns on civilians. Any such doings on unguarded spots at once brought forth a demand for balloons; and it is tragic to remember that one horrible massacre of school children in East London could hardly have happened if, through some stupidity, all the balloons had not been close-hauled at the same time that day.

The day of barrage balloons is not over, and it never will be over while war continues to be an activity of mankind. A certain number is being retained by Fighter Command in this country, and others overseas will continue to fly under the orders of the appropriate R.A.F. Commands. No doubt shipping convoys will continue to fly balloons wherever the Admiralty thinks it desirable to use them.

In our post-war organisation the balloons must not be forgotten. Wherever we find it necessary to station fighter aircraft, there balloons must be provided. Before this war broke out they were in the hands of the Auxiliary Air Force. Whether they (and the Royal Observer Corps) will remain on a part-time civilian basis cannot yet be said. But we must all be quite sure of this, that the disappearance of Balloon Command does not mean the disappearance of balloon barrages.

Too Many Accidents

ATTENTION—of the wrong kind—has been drawn to the work of Transport Command of the Royal Air Force by recent accidents. First, we had the one involving the lives of two M.P.s. That was followed a short time later by the crash of the York which was carrying members of Mr. Churchill's staff, in which 15 were killed or missing. The day after the delayed announcement of this accident there was another in which 23 men of the R.A.F. lost their lives when their machine crashed into the South Downs.

On February 1st the Air Ministry issued a bulletin which began with the words: "The routes of R.A.F. Transport Command now form a world system, and are run with the regularity of peacetime surface transport." To make such a claim was, of course, rather childish. No commercial air route has ever claimed to equal surface transport in the matter of regularity—at any rate, not when the comparison is based upon the volume of traffic carried, and it was somewhat unfortunate that on the very day when this smug claim was made by the Air Ministry, the machine carrying members of the Prime Minister's staff crashed.

It might, perhaps, be argued that neither the York

nor the aircraft which crashed on the South Downs was flying on Transport Command's regular routes which, in one month, covered 4,750,000 track miles. The fact remains, however, that the number of accidents is causing disquiet in many quarters, and one wonders whether familiarity with war flying in general, with its inevitable risks, has caused the organising personnel to approach its duties in the wrong spirit.

Replying to questions in the Commons, Sir Archibald Sinclair stated that "Flying in wartime involves certain hazards inseparable from war conditions, but the House will be glad to know that the accident rate of the Royal Air Force has been steadily falling for some time." That may be so for the R.A.F. as a whole, to which the Air Minister was apparently referring, but in Transport Command there should not be the same risks as in Bomber Command, for example. Modern radio and radar aids to navigation are such that aircraft should not be in doubt about their location at any time during a flight.

Ingenious or Ingenuous?

"INDICATOR" this week makes a suggestion for ensuring that in the post-war years aircraft on the regular routes shall always fly to time-table, no matter what the weather; or at least, that an aircraft shall always leave at the scheduled time. The suggestion is that a so-called "bad-weather flight" should be held in readiness to take over in cases where the weather was so bad that the normal aircraft could not undertake the flight with a sufficient guarantee of getting through safely.

We remember a suggestion made to us—half in earnest—by the late Reggie Mitchell. It was during the Schneider Trophy period, and "R. J.," knowing the temperamental nature of the racing seaplanes and their engines, felt that sooner or later all the competitors would be forced out of the race by failures of one sort or another. His suggestion was that an old Supermarine Southampton flying boat should be held in reserve so that if the thoroughbreds broke down, Great Britain could finish the race with the old Southampton. "Can't you just see," he said, "the Southampton crossing the finishing line going flat out at 100 m.p.h. with everyone on board standing up and waving their bowler hats?"

As things turned out, the marvellous Rolls-Royce racing engines stood up to the gruelling test, and the old Southampton was never required, had it been available. But the underlying thought was sound. Can as much be said for "Indicator's" suggestion? All will agree with him in his plea that safety should come first in air transport, but it seems extremely doubtful that any firm, even the "really large airline company" to which he refers, would be able to afford the large capital expenditure needed to keep all-weather aircraft in readiness at all termini. In addition to the aircraft, it would be necessary to have reserve crews standing by.

A more practical solution would appear to be that of using, on routes where fogs and icing conditions were likely to be met, aircraft types fully equipped with the necessary paraphernalia and manned by crews competent to deal with such emergencies. It would probably be cheaper for the operator to sacrifice the percentage of payload which the carrying of this all-weather equipment would entail. One does rather feel that if the regular aircraft were not capable of dealing with such obstacles it would not be fit to be put on the route.

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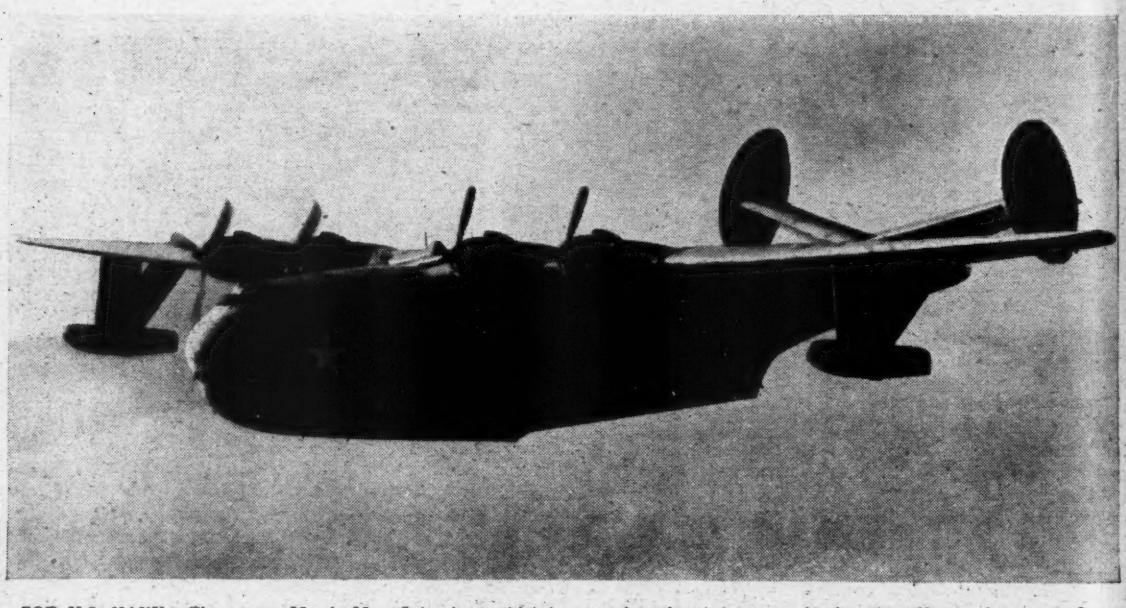


FOR U.S. NAVY: The 70-ton Martin Mars flying boat which has now been handed over to the American Navy. It recently flew 4,375 miles non-stop. The wing span is 200ft.

AFTER THE SHOW: Deck crews folding the wings of a rocket-firing Firefly on H.M.S. *Indefatigable* after the attack on the Japanese oil refinery in Sumatra.

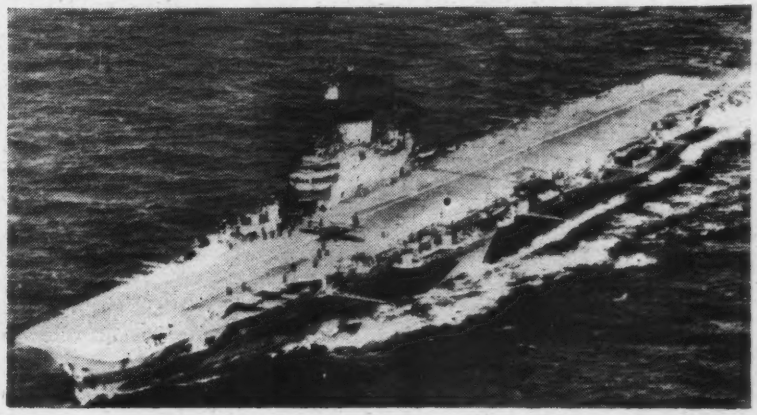
WAR in the AIR

The Leaders Meet : R.N. Carrier Strength in the Pacific : New Western Offensive Begun

ANOTHER meeting of the Big Three, Churchill, Roosevelt, and Stalin, is always an event of earth-shaking importance. One never knows what they talk about at the time; but one sees the results afterwards. There are not many parts of the world in which they can all meet, and it was not surprising to learn that this time it was in the Black Sea area. The word "area" may cover a lot of ground.

What a misfortune it would be if those three could never meet—and without air transport it is fairly certain that they could not. The mishap to one aircraft which cost the lives of valuable members of Mr. Churchill's staff has shed some gloom over the present meeting; but though aircraft have caused many tears to be shed during the present war, their services to humanity (e.g., enabling the leaders to meet) outweigh the tragedies and leave aircraft with a good credit balance. There are some humanitarians who look only on bomb damage, and openly lament that man ever learnt how to fly. If he had not made that discovery, the Germans might well have won the present war.

Any mention of Rear-Admiral Sir Philip Vian is exciting. When he moves, other things move, too. His recent raid on Japanese oil refineries in the Palembang district of Sumatra gave us all some very interesting information about the British Fleet in that part of the world. No less than four of our latest carriers took part in it, namely H.M.S. *Illustrious*, *Victorious*, *Indomitable* and *Indefatigable*. The last-named had not been mentioned before as having been commissioned, and the photographs published of her showed that she was not an exact copy of her predecessors but in certain ways a more modern design.



FOR THE NAVY THAT FLIES: An aerial photograph of the new aircraft carrier H.M.S. *Indefatigable* which is now serving with the Eastern Fleet.

WAR IN THE AIR

Such a precious body of carriers needed a strong escort; and the battleship H.M.S. *King George V* (whose 14in. guns silenced the fire of the Bismarck) and six cruisers went too.

Attacks were made on Jan. 24th and 29th by the aircraft of the fleet, and the oil refineries were left in a sorry state. Japan has not now got the tankers to carry the crude oil to refineries in her homeland, and so the local refineries were particularly valuable. Certain Japanese activities will now have to go short of fuel.

On the day of the first raid enemy aircraft put up a determined opposition, and lost heavily in consequence. On the second day there were naturally not so many enemy aircraft available. Of course some attempts were made to bomb or torpedo the Fleet. Some Japanese pilots may have dreamed of a repetition of that day off Malaya when H.M.S. *Prince of Wales* and *Repulse* were sunk. But this time we had air cover. The fighters of the Fleet drove off all such attempts except one. On that one occasion seven Japanese aircraft got past the protective screen, but found Seafires, Hellcats, and the guns of the ships waiting for them. Six were promptly shot down, and the report says magnanimously that "the fate of the seventh is doubtful."

In the two days 15 British aircraft were lost; the ships suffered no damage and few casualties.

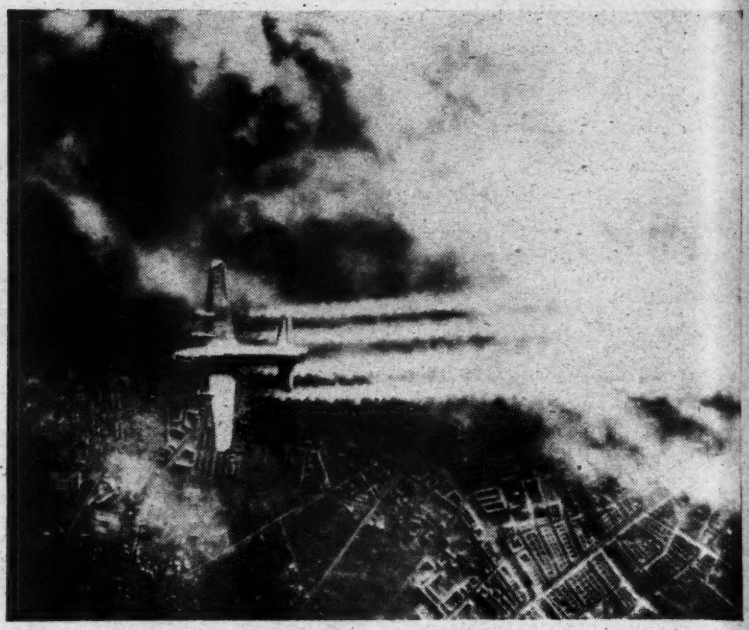
Since this action, Admiral Sir Bertram Ramsay, the British Naval C.-in C., has stated that half of the major ships in the British Fleet would be carriers. The Japanese are welcome to that piece of information.

New West Offensive

PROBABLY Field Marshal Montgomery did a good deal of consulting with the meteorologists before settling the date for his attack in the Nijmegen area. The weather was patchy (one cannot expect much in February) but our aircraft were able to fly. Heavy bombers now do not take much account of the weather, and so, on the night before the attack opened 700 of them made a sharp raid on the German troops and equipment in the little towns of Cleve and Goch. Cleve is the end of the Siegfried line proper. The artillery indulged in a bombardment for 11 hours, and then the infantry and tanks went forward. What are described as light bombers (the term has seemed almost obsolete for some time past) made a series of audacious attacks on German troops at various points only 1,000 yards ahead of the advancing Canadians and British. When the bombers arrived the targets were hidden by thick cloud, and the bombing was done by instruments. It must have been an anxious time for the pilots, and not less so for the troops whom they were trying to help. For the German soldiers the bombs must have come, not as "bolts from the blue," but as a very unpleasant surprise.

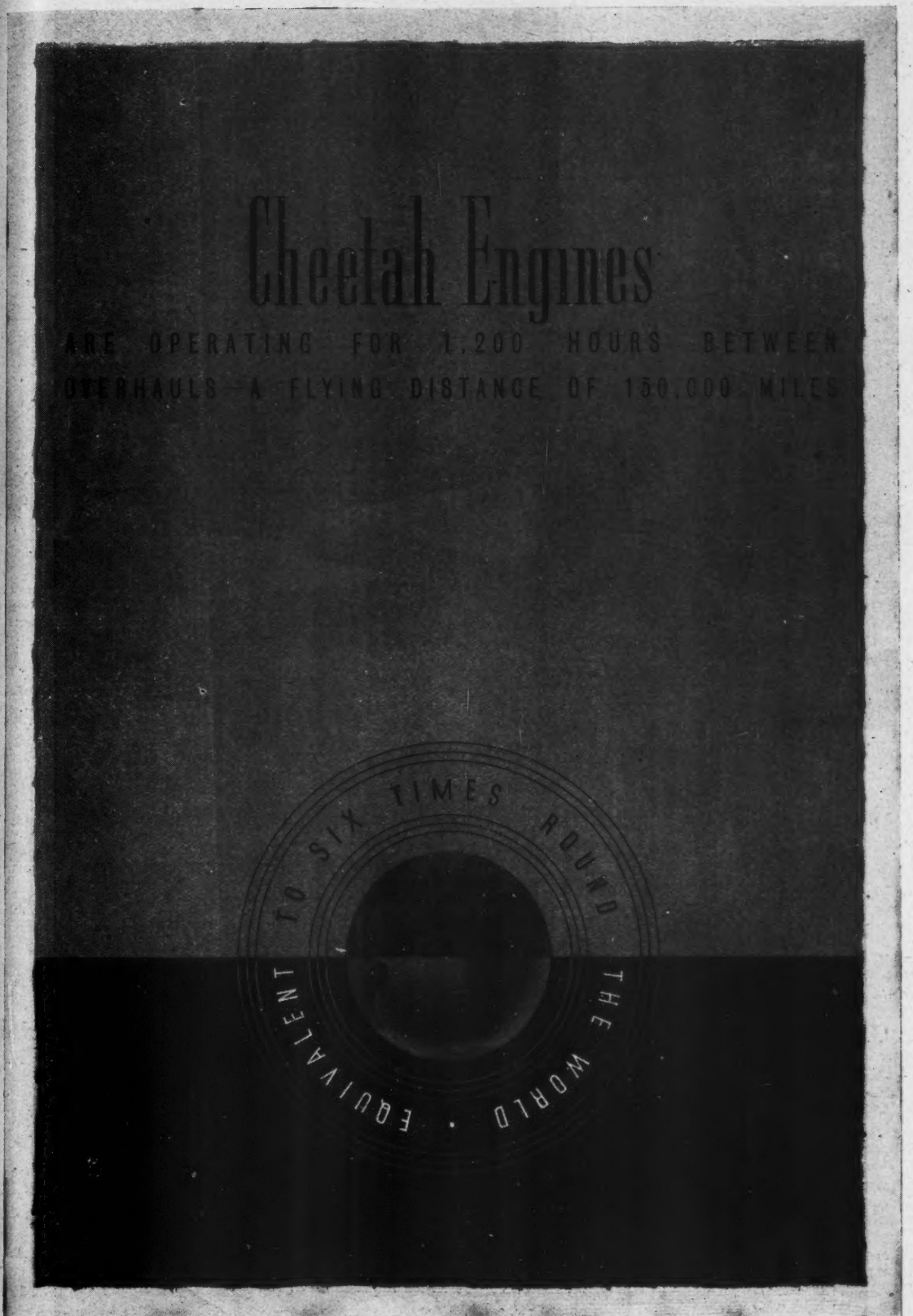
Our fighter-bombers used with great effect a new type of anti-personnel bomb, especially round about Goch. They also found much increased railway movement behind the German lines during the afternoon, and they destroyed or damaged 55 locomotives and 160 trucks, as well as 50 road vehicles.

The *Luftwaffe* showed some desire



CAPITAL PUNISHMENT: Flying Fortresses of the U.S. 8th A.F. on their recent 1,000-aircraft raid on Berlin in daylight. A total of 2,500 tons of bombs was dropped.

THE RENDEZVOUS: Fleet Air Arm squadrons forming up for the strike against the oil refinery at Pangkalan Brandan in Sumatra. In the foreground are Grumman Avengers.


Cheetah Engines
ARE OPERATING FOR 1,200 HOURS BETWEEN
OVERHAULS—A FLYING DISTANCE OF 150,000 MILES
EQUIVALENT TO SIX TIMES ROUND THE WORLD

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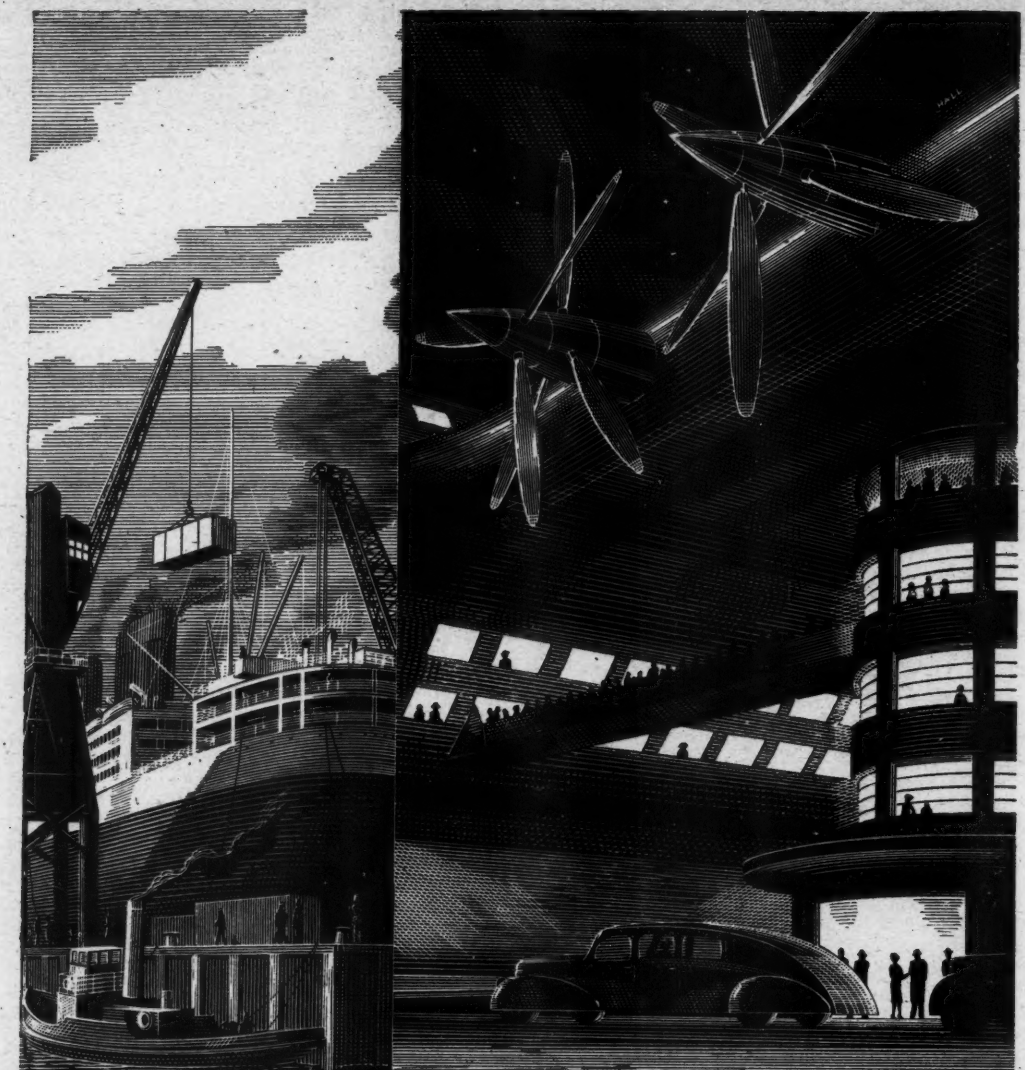

"We may find that ships and trains will be all-heavy-freight carrying (and very likely waxing prosperous in so doing), whilst all passengers and much light merchandise are transported through the air."

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WAR IN THE AIR

to take part in the battle, but our fighters did sentry-go over the airfields round Rheine, Münster, and Osnabrück, so not many enemy aircraft were able to take-off. Some few did manage to do so, and ten were accounted for by our fighters. It is curious to read that five of these victims were dive bombers, though of what type has not been reported.

Meantime the U.S. 3rd Army made ten new crossings of the Our and Sure rivers into Germany, and that their advance was dashing is shown by the fact that some of their units had to be supplied by air.

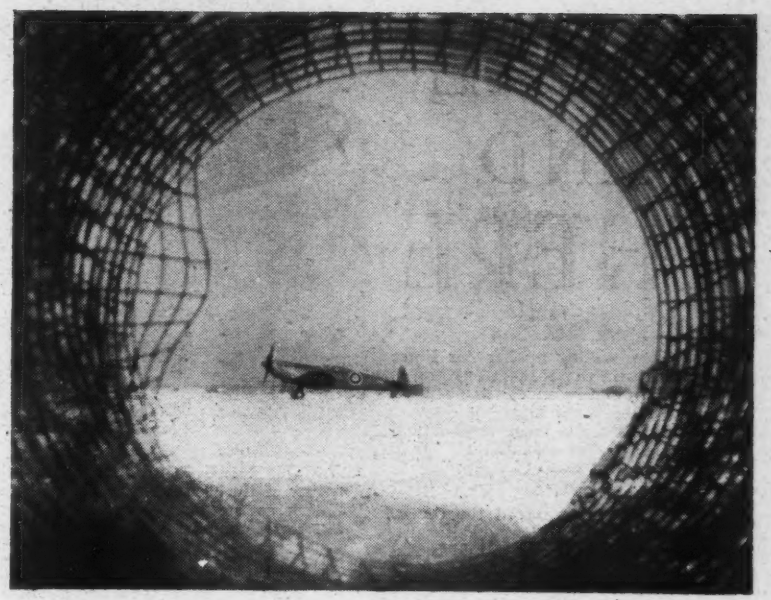
The state of the weather over Europe was graphically brought home to one by the admission that on Thursday last week a British reconnaissance aircraft was able to fly over Berlin. Such a flight had not been possible for some four months before. That did not mean that bombers had not been able to find the Reich capital; but naturally everyone wanted to know what the results of their work had been, and photography demands better weather than bombing does. In the centre of the city an area of one and a half square miles was devastated by the attack of U.S. heavy bombers on February 3rd. Many important state buildings were claimed as hit, including the main post and telegraph office, the Foreign Office, the Ministry of Transport, the Reich Chancellery, the Air Ministry, the Gestapo H.Q., the Treasury, the State Railway Directorate, and the office housing the secret archives, besides some railway stations.

Of these, one imagines that Germany will not be seriously embarrassed by damage to the Foreign Office; but most of the other buildings mentioned as damaged must be very important at the present critical time. The Air Ministry, which now has not got a very imposing *Luftwaffe* to control, was said to have a quite remarkable thickness of concrete over its roof. Perhaps it might have withstood the heaviest bombs which Fortresses and Liberators could convey to Berlin; but the heaviest Lancaster bombs have shown a great power of piercing such defences.

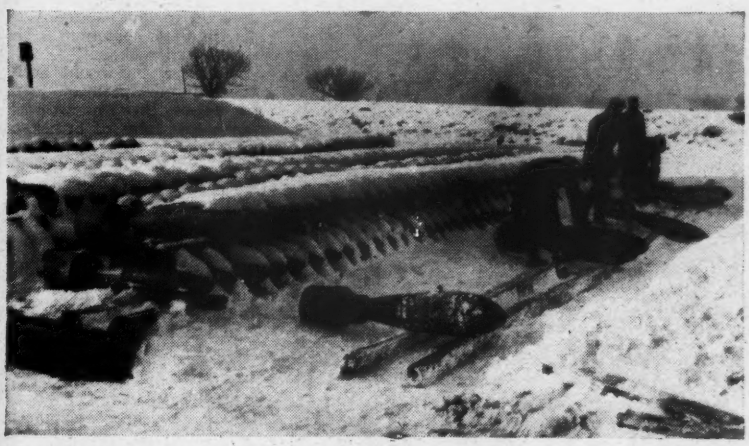
The problem which Berlin has to tackle now is the unprecedented influx of refugees from East Prussia. The numbers are said to have run into several millions. Housing them must alone be a great problem; and the repeated attacks by Mosquitoes with 4,000 lb. bombs (though not intended to harm civilian refugees) must have greatly aggravated the housing problem. It would be amusing, if it were not so disgusting, to hear that German propaganda is now claiming that the Germans treated the French refugees in 1940 with every consideration and kindness, and that no German aircraft ever bombed or machine-gunned them. There are plenty of British airmen and soldiers who know better than that; for they saw the cruel work, and were filled with righteous rage and indignation.

The Russian communiqués continue to report a modest total of 26 to 30 enemy aircraft shot down every day on the whole enormous Russian front. The Russians hold air superiority in general, and at places it is overwhelming, and consequently we should have expected to hear of greater air battles and heavier German losses. Yet we know that the best *Luftwaffe* pilots will still fight with determination.

In the struggle on the West Front the Tactical Air Forces have had only fleeting opportunities; but they have seized every one. It appears now that the trend of German troop movements is westward rather than eastward, as they appeared to be some time ago. In the brief intervals of good or moderate flying weather the Allied aircraft have struck at very many trains and damaged locomotives and wagons. If one puts oneself in the position of the German High Command one can imagine the difficulties of resisting on two fronts and deciding which is the more important at any one moment. Perhaps the trains which Allied airmen attacked carried equipment rather than reinforcements; but certainly the British and Americans have taken prisoners who have recently been on the Russian front, and they have been horrified (and often incredulous) when told of the true position there.

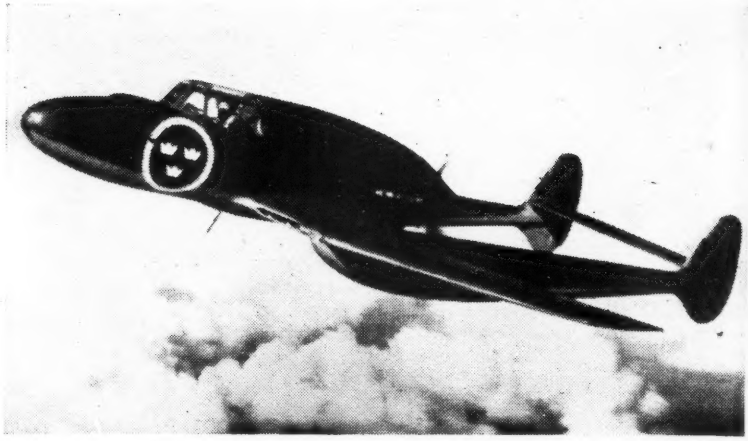


INNER CIRCLE: A 2nd T.A.F. Spitfire taxying on an airfield in Holland. The frame is a roll of Somerfeld landing-strip wire.



IN COLD STORAGE: A dump of streamlined general-purpose bombs under snow in Holland.

HERE AND THERE



ANOTHER BIG PUSH: An item below gives brief details of a new American fighter of the "pusher" type, and here is a photograph of a new Swedish fighter, known as the J-21, in production for the Swedish Air Force, with engine and airscrew behind the pilot but carrying a normal tail-unit on twin booms. A tricycle undercarriage is fitted.

French Call-up

FRANCE is calling up her Air Force reservists in the 1924-42 age group, Paris Radio recently announced, and all Air Force reservists in these classes who are living in France must register and will be called up individually.

Mr. Percy Pritchard

FLIGHT regrets to record the death, last week, of Mr. Percy Pritchard, joint managing director of Birmid Industries, Ltd., at the age of 52.

Mr. Pritchard, who was also president of the British Cast Iron Research Association, and an acknowledged authority on metallurgical engineering, was attending a Masonic meeting in Birmingham when he suddenly collapsed and died.

Use of Air Mail Labels

TO clear up some apparent misunderstanding about the use of air mail labels, it has been announced that letters weighing less than one ounce for the Forces in the Far East, and for the Royal Navy and Merchant Navy, do not require air mail labels to secure transmission by air.

But they are required for these destinations on letters weighing more than one ounce.

Adding More Lightness

A CHANGE from power-operated to hand-operated gun turrets might seem retrogressive, but the latest tail turret installed on the Liberator, mounting a pair of 0.5in. machine guns, is a hand-operated type.

Saving precious weight and an increased field of fire seem to be the joint reasons for this change; the new turret weighs 200 lb. less than the power-operated type formerly fitted, according to our American contemporary, *Flying*.

Fewer, but Heavier

THE current trend towards bigger and heavier aircraft is reflected in figures just given out by Mr. J. A. Krug, chairman of the U.S. War Production Board, on the December and January output in America.

Mr. Krug said that while the total number of aircraft produced last month was 6,535, compared with the December output of 6,697, the airframe weight involved showed a rise from 71,000,000 lb. to 72,300,000 lb.—an increase of 1 per cent.

Actually the January output was 4 per cent. under the 6,829 aircraft which had been scheduled for the month.

U.S. "Tail-first" Fighter

CURTISS-WRIGHT are experimenting with a new "tail-first" fighter powered by a 1,275 h.p. Allison in-line engine for which they claim better manœuvrability at high speed, better visibility for the pilot, and an all-round superior performance over conventional fighters of similar power.

The engine, mounted behind the pilot, drives a pusher airscrew which can be jettisoned if the pilot has to bale out, rudders are on the wing-tips, and elevators on the small forward stabilising plane.

The new fighter has been named the Ascender.

R.A.F. Community Centre

A LARGE gathering from many parts of the country attended the recent opening at Westcott by Air Vice-Marshal Thorold, A.O.C. an R.A.F. group, of a new R.A.F. community centre, the object of which, he said, was to "improve the quality of living by giving opportunities for social, recreational and cultural activities" in addition to the existing amenities in the form of dances, cinemas and outdoor games.

A tree theme has been employed in the decorative scheme as an emblem of good community living.

F.A.A. in Australia

TO meet the shore-based requirements of the Fleet Air Arm when the British Navy units begin operations from Australian bases, the R.A.A.F. is spending £4,000,000 on airstrips and buildings.

The Australian Air Force is providing facilities, such as shorestrips and hangars, to ensure that replacement crews are kept in training while carrier units of the fleet are at sea on operations.

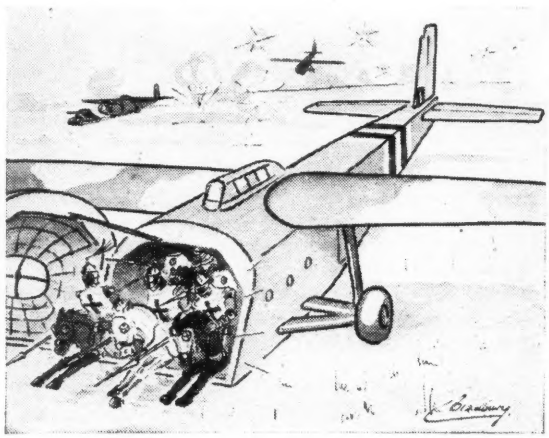
New air stations costing about £2,500,000 are in the advanced stages of construction, and another £1,500,000 is being spent at other Australian bases.

Mum's the Word!

"I AM unable to discuss new weapons which might be used against Germany," said the Deputy Prime Minister, Mr. Attlee, when asked by Mr. Purbrick (Con., Walton) in the Commons recently when we and our Allies would be in a position to give Germany indiscriminate bombing "by robots and rockets."

Asked if he would notify them of our intention to do so unless they immediately cease this form of attack on us and the liberated countries, Mr. Attlee referred Mr. Purbrick to "a previous reply of December 12th."

This was, broadly, to the effect that our policy is to continue striking at Germany where it will do most good to our war effort and most harm to hers—which seems a pretty sound policy, all things considered.



"This should shake them."

U.S. Rocket Development

THE rocket development scheme of the American Navy Department incorporates an expenditure of $100,000,000 (£25,000,000)

HERE AND THERE

for ammunition alone, says New York Radio, quoted by Reuter.

The production of these rockets is connected with the $35,000,000 ordnance test station approved by the Navy Department to be set up in California's Mojave Desert.

This station will carry out in war and peace research on such a scale that the U.S.A. will never again be surprised technologically by another war, New York Radio added.

Large-scale developments of rockets will be first on the station's order list for the permanent Navy shore installations to be concluded eighteen months from now.

Ford factories have built copies of V1.

Too Simple Division

WHO would have thought that such an erudite body as S.B.A.C. could lead anyone astray?

Culling an item from its *Press Summary* for this page in our issue of January 25th, *Flight*, with a touching faith (now shattered) in the infallibility of that "Cæsar's Wife" of organisations, unsuspectingly reproduced the erroneous statement that the Gipsy-Queen engines of the Miles M-60 feeder-line project will *each* have a cruising output of 360 h.p.

It appeared, on subsequent enquiry, that the total power output had been divided by two instead of four; they must have been thinking of the Dominie with two Gipsy Queens. As our old headmaster used to say, *Timor Domini Initium Sapientiae*, which, very freely translated, might be rendered "Beware of the Dominie if you want to get it right."

GARGANTUAN GUINEA-PIG: As recorded in these columns on Feb. 1st, the Douglas B-19 "biggest ever" bomber, for some time used for experimental work at Wright Field, has now been fitted with four 2,600 h.p. 24-cyl. Allison "W" engines. The aircraft's crew in the picture give a good idea of the size of the new installations.

Short History in Models

SIX beautifully finished scale models of aircraft produced by Short Bros. were recently presented to the Mayor of Rochester (Councillor C. S. Knight) by the chairman of the company, Sir Frederick Heaton, and are to be placed in the city's museum.

They constitute a potted history of Short progress from 1911 to the present day, for they represent the following famous products: The "Triple Twin" biplane of 1911 employing three airscrews driven by two engines which was the first multi-engined aircraft in the world; the twin-float seaplane of 1914, known as the "Two-two-five," which was the first aircraft to be designed as a torpedo-carrier and the first to have folding wings; the "Silver Streak" of 1920 which was the first British all-metal aircraft and which pioneered stressed-skin construction; the giant six-engined Sarafand flying boat of 193- (span 120ft.) fitted with three tandem pairs of 950 h.p. Rolls-Royce Buzzards; the Sunderland introduced in 1937 and still going strong; and finally the Stirling four-engined heavy bomber. (*See adjoining picture*)

MUSEUM PIECES: Here are the models presented to the City of Rochester museum by Short Bros. (see adjacent paragraph) illustrating their progress since 1911. Admiring them are (from the left) Mr. P. G. Stone Clark, Councillor C. S. Knight (Mayor), and Sir Frederick Heaton. The models cover the range of Short types from the "Triplex-Twin" to the Stirling bomber. The large model is the Sarafand.

Misprint

OUR apologies to Grp. Capt. E. R. C. Nanson, who was appointed Inspector of Recruiting in a civilian capacity on his retirement from the R.A.F. in 1932 and donned the uniform again in 1939, for allowing a misprint to change the first letter of his name to an "H" when we announced his recent retirement from the Air Ministry, in last week's *Flight*, after 12 years' service in his last appointment.

Grp. Capt. Nanson will be particularly remembered as C.O. of the Calshot station during Schneider Trophy days.

Trade Appointments

MR. ERNEST J. P. TAYLOR, who joined the Dunlop Rubber Co., Ltd., in 1919 (after four years' service in the Middle East), has been appointed registrar of the company in succession to Mr. A. J. Bray. Mr. Taylor has been assistant, since 1935, to Mr. Bray, who retires after 38 years' service with the firm.

* * * *

Mr. C. W. Sharp has joined the board of Messier Aircraft Equipment, Ltd., as deputy managing director.

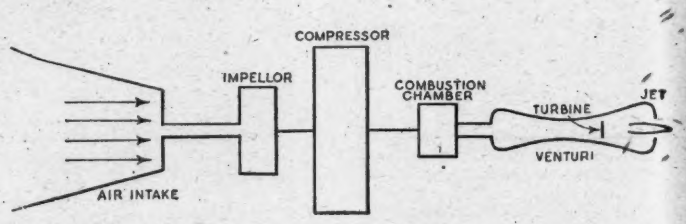
D

Jet Propulsion

Basic Principles Explained : Radial and Axial-flow Compressors : Open and Closed-circuit Systems

By K. G. ATTKINS

THE most common fallacy among those who begin thinking of jet propulsion for the first time is that it is obtained by blowing a large mass of gas rearwards against the surrounding air, and that it is this impinging of the gas on the air which produces the thrust needed to drive the aircraft. This is incorrect. If it were so there would be no thrust in a vacuum, whereas in point of fact greater speeds are obtainable in "thin" air because the resistance of the aircraft is lower.

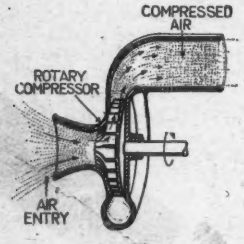


Diagrammatic representation of the main components in an open-circuit system.

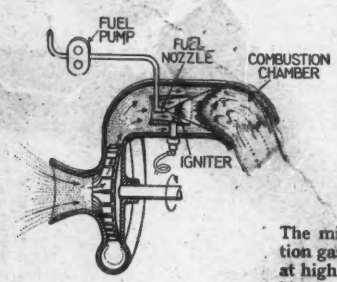
Jet propulsion is based upon Newton's Third Law of Motion, which states that to every action there is an equal and opposite reaction. Perhaps the application of this law is most easily grasped by thinking of firing a rifle or machine gun over the stern of a light boat such as a dinghy. When a rifle is fired there is a pronounced recoil, caused by the reaction of accelerating the bullet on its way down the barrel. In the case of a machine gun there is a prolonged series of recoils, and this series would cause the dinghy to move forward slowly. The low speed is due to the fact that the weight of the bullets is small compared with that of the machine gun, gunner and dinghy, although the speed of the bullets is high. If one weighed them it would be found that the weight of the bullets multiplied by their speed would be equal to the weight of the dinghy multiplied by its speed. Differently expressed, mass *a* multiplied by its high velocity would equal mass *b* multiplied by its low velocity.

Applying the same principle to jet propulsion, it will be obvious that the same reaction, or in other words the same thrust, can be obtained by either blowing back a small mass of gas at very high velocity or a larger mass of gas at a lower velocity. So long as the product of mass and velocity is the same, the thrust will be the same.

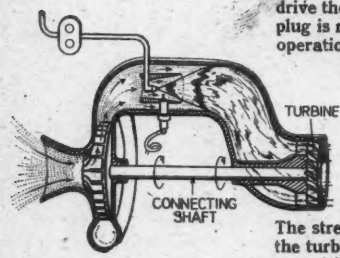
The Working Cycle



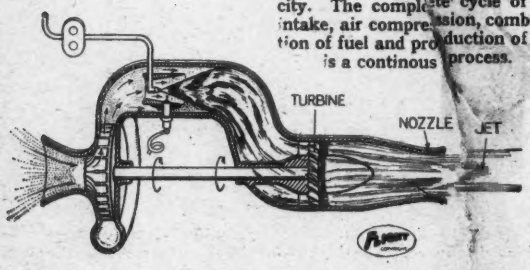
When starting up, the shaft is rotated by a starter motor. Air is drawn in and then compressed by the rotary compressor into the combustion chamber.



A fine jet of fuel is sprayed into the compressed air. The mixture of fuel and air burns continuously. Initially it is ignited by an electric glow plug.



The mixture of heated combustion gases and air forces its way at high velocity through the turbine, causing it to rotate and drive the compressor. The igniter plug is now switched off and the operation continues so long as fuel is injected.

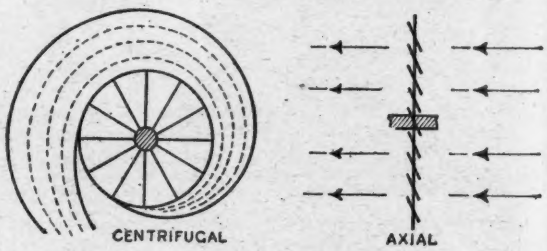


The stream of gas and air leaves the turbine and issues from the propulsion nozzle at high velocity. The complete cycle of air intake, air compression, combustion of fuel and production of jet is a continous process.

The Jet System

A jet system works on the principle of adiabatic expansion of gases. The necessary expansion is partly obtained by heating the gases, or, in fact, burning them. First a large mass of air is drawn in by an impellor or fan and passed to a compressor in which it is compressed and fuel injected. Then it passes to the next stage where it is burnt and hence expanded, making its way at a very high velocity to the jet orifice which forms its only means of escape. But on its journey it encounters a turbine which is connected to the compressor and impellor, which it drives at high speed, thus sucking in and compressing more and more air for continued combustion. That, in brief, is the essence of the jet system. It must, of course, be realised that these are the very elementary principles, and in the design of such a system, many complications occur.

It is as well to realise here that very high temperatures



Two main types of compressor are used, the radial or centrifugal, and the axial-flow type.

are obtained, for efficiency to be at its highest these are accompanied by high rotational speeds in the order of 30,000-50,000 r.p.m., both adding to form headaches for the designer. All bearings, shafts, etc., are fluid-cooled, and the selection of metals for construction is a job in itself.

The rude elements of the jet being discussed, let us take a glance at it from an aircraft designer's point of view and examine what effect it is going to have on his work. In some ways it helps him overcome certain problems, and necessarily it creates new. For instance, the problems of the airscrew, which have caused the designers to carry out years of research to beat compressibility effects on its blades and to bring about the production of variable-pitch blades so that maximum efficiency can be maintained under all conditions of flight, are eliminated by jet systems. Since reciprocating engines are becoming greatly developed in power, the blade area had somehow to be increased, so that it could absorb this excess power at altitude. But it is not possible to increase the diameter indefinitely, since it would be inviting compressibility effects and cause the undercarriage to be of prohibitive height, so the only way was to increase the number of blades, hence the new five-blade type. It is rapidly becoming necessary to use contra-rotating screws to decrease torque reaction and to improve airscrew efficiency with high-power engines. All this is avoided in the jet. But new problems of just as great a magnitude have arrived. Perhaps the biggest bugbear of the jet is that its efficiency is poor at low altitudes and speeds, and, therefore, take-off and climb suffer. Once at altitude the jet comes into its own, and its efficiency may exceed that of the screw.

Thrust augmentation obtained by means of a venturi tube in which the gases have their pressure reduced and their speed increased.

Landing speeds form a problem, too. Designers have been striving for more and more speed, and to get it they have had to sacrifice lift by reducing wing area. It is obvious, then, that to keep the aircraft airborne a high speed is necessary and stalling speeds automatically obtain high values, thus increasing the difficulty of landing. The tricycle undercarriage has done a lot to help solve the problem, but greater measures will probably be required later, perhaps some form of rocket retardation or reversal of part of the jet system, will be called upon.

With a jet engine, undercarriages can be of very low build, thus improving take-off stability and increasing the pilot's view forward, which can be further enhanced by moving the cockpit forward since no airscrew or engine bars the way.

The power-weight ratio of a jet engine is much better than that of the ordinary reciprocating engine, which, even on the most modern types, is about 1.7 lb./h.p. This should make for better efficiency in manœuvrability. Unfortunately, the jet engine is at present rather extravagant as regards fuel, but no doubt this can be bettered in the future designs.

The aircraft designer will also have to provide pressure cabins because the jet is definitely a high-altitude device. He will also be faced with the compressibility effects which accompany high flight speeds at great altitudes. The higher one flies the lower is the speed of sound, and the quicker one approaches the point where shock waves reduce the efficiency of the aircraft considerably and cause large loads to be imposed on the structure. Several suggestions have been put forward, including boundary layer control, and it is to be hoped that the ingenuity of aircraft designers will be able to cope with these new and harassing problems.

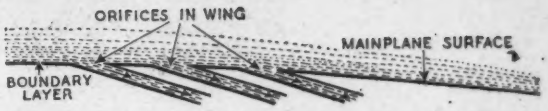


Diagram of boundary layer control by sucking air from the wing surface into the venturi.

JUDGING from letters we receive, interest in the subject of jet propulsion is as keen as ever. In fact, it appears to be growing. Unfortunately the book "Gas Turbines and Jet Propulsion for Aircraft," by G. Geoffrey Smith, is out of print. A new edition is being prepared, but until this is available many are prevented from starting their studies of this fascinating subject.

The notes by Mr. Atkins will, it is felt, be welcomed by many of our readers as a means to familiarising themselves with the fundamental problems of jet propulsion and the working of gas turbines while waiting for the new edition of the book.

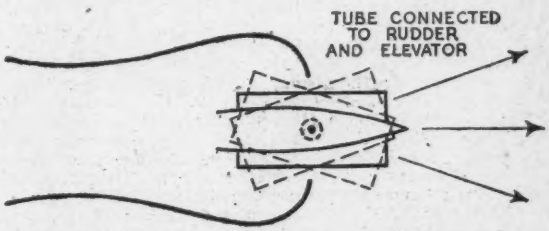
Having reviewed the effects of jet propulsion on the aircraft itself, we are in a position to carry on deeper into the subject. The best way to understand the various systems is to divide them into two kinds of circuit: the open (of which we have already examined the basic elements) and the closed-circuit system.

We saw that in the open-circuit system the object was to draw large masses of air in from the surrounding atmosphere by means of an impellor and then compress it and spray fuel into the mass and then burn it, thus causing further expansion. The gas was then ejected through an orifice, first making it drive a turbine rotor to which is connected, by means of a shaft, the impellor and compressors.

There are two types of compressor, centrifugal and axial. The centrifugal types take air in at the hub, and it is then picked up by the fast-rotating rotor blades and flung outwards, where it is gathered by a helical venturi which tends to accelerate it further. The axial type, as the name suggests, receives a flow parallel to its axis, accelerates it and passes it on, still in an axial form of flow. It is really just a reversed turbine. It is difficult to say which is the better, because each has its own particular advantages when used in its correct place. But on the whole, for a compressor of the type we are speaking of, the axial-flow type may be slightly the better. For the turbine, also, the axial-flow type may be the more efficient. It consists of several sets of rotor blades, in between which are fixed blades. These serve to redirect the flow after it leaves the preceding rotor, and set the stream at the right angle of attack for the next rotor. Very high rotational speeds are attained, and high powers can be produced. As has already been shown, this power is transferred by shaft to the impellor and compressor.

Combustion Chamber

Having covered the impellor and compressor, we come to the combustion chamber. This is merely a small chamber, either separate from or joined to, the venturi. In it is a means of igniting the combustible mixture, such



Added controllability of jet-propelled aircraft might be obtained by connecting outlet tubes to rudder and elevator.

JET PROPULSION

as a sparking plug. Once ignited the combustion is continuous, so the igniter can be cut out. Upon being heated to such a high degree the gases rapidly expand and are forced to enter the venturi at a very high velocity. Now, the venturi has the same effect on these gases as does the camber on the upper surface of an aerofoil; that is, it speeds up or accelerates the flow of air and burnt gases, and causes an area of low pressure. This area can be utilised to draw in an extra quantity of air to supplement the existing mass, as is seen below. This is thrust augmentation.

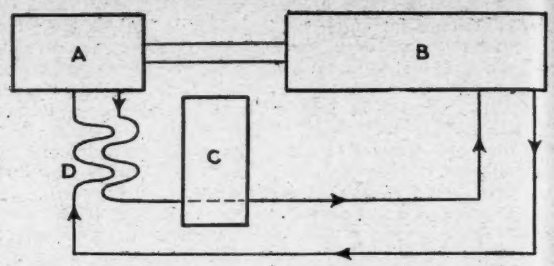
It was mentioned above that extra efficiency would be gained if the boundary layer over the wing could be controlled. Here, then, is our chance. If tubes extend from the combustion chamber to orifices in the wing surface, part of the boundary layer will be drawn in and the main flow over the wing will be sucked closer and prevented from eddying and hence causing loss of efficiency.

Getting back to our venturi, the gases are tearing down it at a very high velocity. They encounter the turbine which drives the compressor and impellor. And now we have reached the jet orifice; this is the only exit for the gases, which force their way out, their momentum creating the reactionary thrust forwards in the aircraft. To increase manœuvrability the orifice could be a tube so mounted as to move up and down with the elevator and from side to side with the rudder.

Pre-heating the Air

All the time this is going on, there is more air being sucked in from the surrounding atmosphere, and for more efficient operation it is essential that it be preheated so a portion of the high temperature gases in the combustion chamber can be conducted back and mixed with the cold incoming air to raise the intake temperature. This is called heat exchanging, and can raise the efficiency of a jet system by as much as 20 per cent.

Now let us take a look at the closed-circuit system and its opportunities. Here no material is wasted at all; in other words the cycle is completely closed. Since this is so, an inert gas of comparative rarity can be used as the working medium, preferably of the monatomic type, which is simply a gas in which the molecule, the smallest particle that retains all the characteristics of the gas, contains only one atom. We use such a gas because a high ratio of specific heat at constant volume to specific heat at constant pressure can be obtained, hence a lower compression value will be obtained. This is the gas turbine, and the working of such a system is as follows:—The medium (e.g. Argon or Krypton) is compressed in an axial-flow compressor, passed through pipelines to furnace C, there expanded and then passed to the inlet side of the turbine B, which is of the axial-flow type. The gas is then passed back through a regenerator or heat-exchanger D and thence to the compressor for recirculation. The turbine in this case drives the airscrew and compressor, but a separate engine can be used to drive the compressor if it is thought that efficiency can be so gained.



In this closed-circuit system A is the axial-flow compressor, C the furnace, B the turbine, and D the regenerator or heat-exchanger.

Such a system of course gives perhaps only a few advantages over the reciprocating engines of to-day in regard to power/weight ratio and fuel consumption, and can hardly be called jet propulsion, but the last and final system under discussion is the combined turbine airscrew/jet combination, where the gases are compressed and adiabatically expanded, passed through a turbine which is connected by shafting to the airscrew and compressor, then gathered again and expelled as a jet through a venturi in the normal way.

In both the latter systems we are using an airscrew, and hence we introduce the old headache of tip speeds, since the rotational speeds of a turbine are considerably higher than those of a reciprocating engine, large gearing systems will have to be used, and a reduction in diameter can possibly be effected by the use of four- or five-blade contra-rotation airscrews. Of course, the great advantage gained is the fact that take-off conditions will be greatly improved compared with those obtained by pure jet, and rate of climb will be very good.

Whether pure jet or the turbine systems will supersede is a matter for thought, but it might be suggested that for large transports, etc., of the future, the airscrews/jet combination will be favoured, for it is also possible to make the combination applicable to retardation as well as to provide the propulsive thrust, and perhaps the pure jet propulsion will be put to use in small high-speed aircraft.

To finish up, let us look at the advantages the jet system gives us over the modern reciprocating engine. A summary is as follows:—

Power is applied direct and without transmission losses.
No airscrew used, hence any amount of power available can be used and no torque reaction effects are produced.
Thrust is completely axial.
Fuel of less critical formula can be used.
Airframes of better aerodynamic shape.
Low U/C. gives better ground stability and good view forward for the pilot.
The boundary layer can be more easily controlled.
Heating problems are solved by diverting part of the heated gases.
Better power/weight ratio.
Vibrationless running.
Structure of system much simpler than modern reciprocating engines.

BALLOON COMMAND'S LAST PARADE

AFTER five and a half years of active service R.A.F. Balloon Command officially came to an end last week when, as briefly reported in the February 8th issue of *Flight*, the Secretary of State for Air (Sir Archibald Sinclair) attended a farewell parade, but told the massed ranks of men and women of the Command that their balloons would still continue to "fly" under other Commands of the R.A.F.

Saying that although farewells are sad occasions, this one was marked by feelings of thankfulness for devoted service manfully rendered, because "for more than five years Balloon Command has fought the evil machinations of the Nazis and helped to frustrate their knavish tricks."

The Command came to life in November, 1938, under Air Vice-Marshal O. T. Boyd, and was the logical development of the London Balloon Barrage, which actually came into being with Air Comdre. J. G. Hearson as A.O.C. the previous year, and was largely manned by the Auxiliary Air Force. Recruiting was put into effect early in 1938, and Londoners first saw their balloons in the air during the Munich crisis in September of that year. When war broke out, Balloon Command had some 600 balloons in the air, but by the end of the blitz they had increased to 2,400. During the life of the Command, balloons not only protected London and many British industrial centres, but they helped to guard convoys, went into action on D-Day over the Normandy beaches and over the beaches of Italy and Sicily, and elsewhere. Sir Archibald particularly referred to their splendid work against the flying bomb and to the part played by the W.A.A.F. in Balloon Command. In 1943 over 1,000 balloon sites were taken over by the W.A.A.F., thus releasing many squadrons for overseas.

England–Cape Survey

Halifax Pioneers Resumed Route : Only Six Intermediate Stops

SEVERAL weeks ago we referred to the excellent impression created in South Africa by a Handley Page Halifax bomber which visited the Union some time ago. Fuller particulars of the flight, one of 12,000 miles, are now to hand. It was made with only six intermediate stops and entirely "without incident" and without flaring headlines.

Much of the purely military equipment was stripped from the Halifax before departure, and a large number of special instruments was installed. Basically, the flight was intended to test engines and airframe under diverse weather conditions. Special air thermometers, for example, were installed around the nose of the aircraft. Temperature recorders were connected to each of the 56 cylinders in the four Bristol Hercules 14-cylinder double-bank sleeve valve engines. Inside the fuselage, a vibration measurer was installed, though this was disconnected after the first stages because the aircraft ran so smoothly.

Average overall speed was 215 m.p.h., with the aircraft cruising at leisurely gait, as the object was not to fly to the Cape in the quickest time but to explore local conditions in each zone.

First leg was a 1,000-mile hop across France and Corsica to Naples, the Halifax taking off with more than 2,000 gallons of fuel. Cairo was reached in a 7-hour flight of 1,500 miles, carrying a load equivalent to 54 passengers. The behaviour of the radial air-cooled engines was particularly watched on the next leg to Khartum, which is one of the hottest spots on African air routes. At the sandy airdrome special taxying trials were made, to test the degree of over-heating the engines would stand up to. Periods of ground running for 15 minutes were completed.

Next test was an "altitude" behaviour test, at Asmara, some 7,000 feet above sea level. More than 50 hours' experimental flying was put in here. Despite the thinner air of the high-altitude airport the Halifax took off in 1,000 yards carrying an experimental payload of 14,000 lb.

Returning to Khartum, the journey to the Cape was continued by way of Nairobi, N'Dola and Pretoria. After display at the Cape the return journey was made uneventfully.

Data collected on the trip are now being analysed. Particular interest attaches to the technical reports in their application to the Handley-Page Hermes airliner. This new monoplane, which is scheduled for first flights in the near future, grosses some 70,000 lb., and in its freight version will be able to carry 16,000 lb. of payload. In its passenger versions its range will be up to 2,000 miles non-stop. Top speed is estimated at 340 m.p.h., and economical cruising speed over long distances at 240 m.p.h.

Future of Britain's Aircraft Industry

Rotol Chief's Confidence if Government Gives Right Kind of Support

SPEAKING to a small gathering in London last week, Mr. R. H. Coverley, C.B.E., controller of Rotol, Ltd., expressed his confidence in the future of the British aircraft industry—provided it received the right kind of support from the Government. He recalled how much the nation owes to the aircraft industry, not only in the classic example of the Battle of Britain but in many others. If the Government were mindful of the indebtedness of the Empire to British designers and workers, we had nothing to fear from foreign competition.

Mr. Coverley has but recently returned from a visit to America and Canada, and he had some interesting things to say about his impressions. Whereas we in this country had to be ever alert, due to our proximity to the war theatres, and ready to improvise and make changes, the Americans could follow a longer-term policy, and their tremendous resources enabled them to achieve production on a vast scale. But this very fact sometimes prevented them from making changes which were open to us.

On the subject of airscrews Mr. Coverley pointed out that whereas in America the tendency was towards larger diameters for the more powerful engines, in this country we had developed multiple blades. He thought the airscrew people could promise to convert into thrust at good efficiencies horsepowers up to some 7,000 b.h.p., probably by using two contra-rotating five-bladers.

Jet propulsion had caught the imagination, but he thought the piston engine would be with us for another 15 to 20 years. Even in jet propulsion, airscrews would be used—probably ducted—to act as thrust augmenters, and so the airscrew, in one form or another, would be used for a long time to come. The great problem for high-altitude flying was not so much the airscrew as the supercharging of the large cabin for passengers.

MORE HOT AIR

AFTER all that has been written about Jet Propulsion and the pioneer work of Air Cdre. F. Whittle, Power Jets and B.T.H. in this country, it is amazing to read in the November issue of a Canadian journal *Commercial Aviation* an article "To-day's Answer to Tomorrow's Problem." The notes practically ignore British development work and give full credit to Bell, as so many American journals did in earlier days. Although the Bell has turbine power units based on the British design the writer states "There is a world of difference between the British version of the jet propelled aircraft and the American design. . . ." "The jet propelled plane was one of the most guarded secrets of the war. It (the Bell) had existed for almost 2½ years." Then follows optimistic views of the Bell with a culminating note, "With regard to the British version of the jet propulsion model, there is little difference from the American version."

The intelligent reader, however, is hardly likely to be misled as the writer actually adds this: "the speed of a jet propelled aircraft is said to be in excess of 400 miles an hour, it has also been reported that it is the 'fastest aircraft in the world.' So when one considers that, in September last year, Lt. Bob Knapp pulled a 'Thunderbolt' out of a nose-dive at 840 miles an hour with locked controls, the speed of the 'Squirt,' as it is affectionately called, is easy to calculate."

Enough said.

WALTER CAPLEY

MR. WALTER CAPLEY, of Miles Aircraft, Ltd., was killed in a flying accident last Saturday while testing a Spitfire. From Mr. F. G. Miles we have received the following appreciation:

Walter Capley had many responsibilities in Miles Aircraft, Ltd., including those of manager of our repair and service department, of our Irish factory and of other departments. He was also one of our most outstanding technicians and designers, combining these gifts with great ability as a test pilot, in which capacity he was approved by the Air Ministry. It was in flying that he found his principal delight.

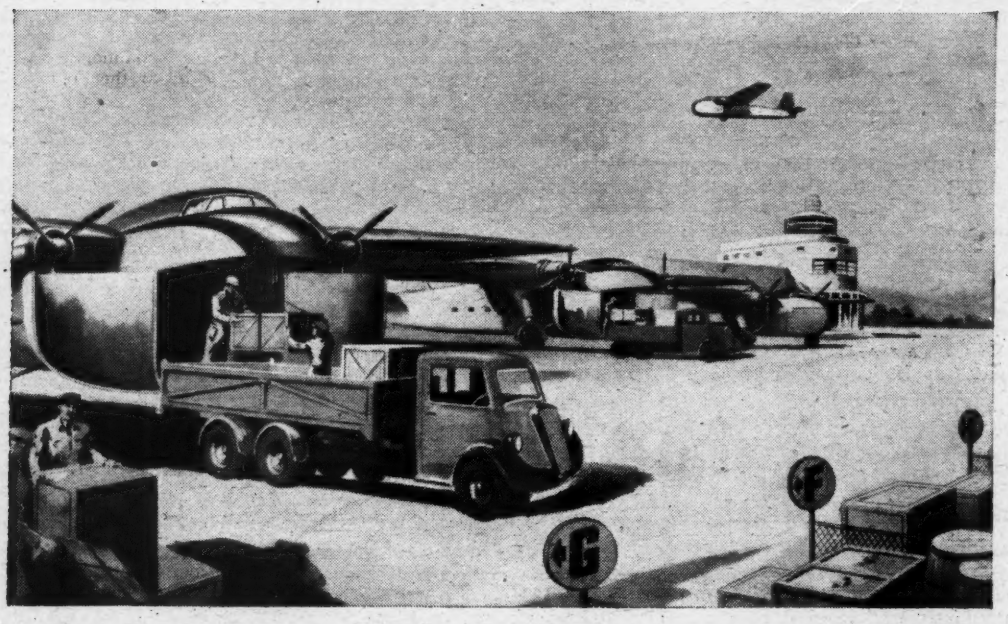
Although he was born in Switzerland, he loved this country deeply and became naturalised. In a world in which I sometimes think such qualities are becoming more rare, he was outstandingly forthright, upright and honest. He was not expedient and would not compromise with principles.

We had the highest plans for him. There was no limit to the place he could have taken with us.

He was loved by and popular with everybody, and he was my very dear and trusted friend.

Cargo Aircraft

By W. S. SHACKLETON



Part II. Dealing with Some New Facts and Figures of the Bristol Freighter

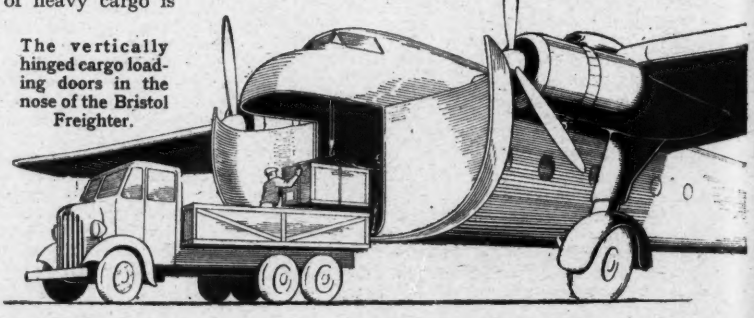
A TWIN-ENGINED high-wing monoplane of all-metal construction—a cargo hold of really generous dimensions, and a fixed (i.e., non-retracting) undercarriage. That is the Bristol Type 170. The engines are Bristol New Perseus nine-cylinder sleeve-valve radials rated at 1,175 b.h.p. for take-off. Any alternative engine in the 1,200 h.p. class can also be fitted.

This aircraft has been designed for the special job of carrying cargo in the most economical manner. We have seen the detail drawings and design data. The construction throughout is very simple, straightforward and robust. There are no power electrics or hydraulics unless one counts the airscrew mechanism. The aircraft is intended for operation from small landing grounds. Its optimum payload is nearly 5 tons. The freight cabin is so big that a standard 3-ton lorry can be driven up a ramp into it. The lorry could even be flown to its destination already loaded with goods. Rapid loading and unloading of heavy cargo is assured by the provision of wide doors, a built-in overhead crane, and an unobstructed hold.

The wing is built in three main sections with the transport joints just outboard of the engine nacelles. As on the Blenheim, Beaufort and Beaufighter, two-spar construction with a stressed-skin covering is used. It is claimed that this method is fundamentally more robust than true monocoque, and is easier to repair. Two fuel tanks of 300 gallons capacity each are slung between the spars inboard of the engines. Although the tanks are high enough to give gravity feed to the carburettors, electric fuel pumps are provided to avoid any possibility of vapour-locks developing in hot weather. The system is designed for pressure refuelling. Split flaps are employed, hydraulically operated by hand pump from the pilot's cabin.

Earlier Perseus engines, as fitted in the D.H. Flamingo and some Short flying boats, developed much less power. The increase has been obtained by increasing the capacity of the engine, running on 100 octane fuel and incorporating a number of detail refinements developed during the war. Each power-egg assembly can be removed complete with oil tank and cooler, cowl and accessories, by withdrawing four pins from the attachments to the nacelle.

The oil cooler is placed at the top of the assembly, with the tank lower down, so that the cooler drains into the tank when the engine is



The vertically hinged cargo loading doors in the nose of the Bristol Freighter.

stopped. This avoids the possibility of oil congealing in the cooler and causing trouble in cold weather.

An up-draught carburettor is used, the air intake being underneath.

It has been found possible to utilise fixed cooling gills suitable either for temperate or tropical operation, thus saving complication and maintenance costs.

Airscrews are Rotol hydraulic fully-feathering type with wood blades 12ft. 6in. diameter.

The big cargo hold is designed for the rapid transfer of goods. Two large doors with vertical hinges give unobstructed access to the full width of the hold. A lorry can be backed up against the front opening and loaded or unloaded direct. A 10 cwt. crane carried on an overhead rail built into the cabin roof enables heavy packages to be transported along the hold. Two cranes in tandem may be used for very heavy cargo.

Aft of the main cabin is a separate compartment for mail or valuable freight. It has one doorway into the main hold and another measuring 5ft. by 2ft. 6in. in the fuselage side. The cabin floor is designed for a unit loading of 200 lb./sq. ft., but two 16in. wide strips along each side of the floor are built in to take wheeled vehicles having a maximum wheel load of 5,000 lb.

Floor Angle

There are numerous tying-down points along the floor and walls because freight must not be allowed to move. We were pleased to see that the cabin has a wooden floor built up from quickly detachable panels. Wood is better than metal for this job. The flooring is carried on metal cross-beams 8in. deep. Incidentally, the cabin floor slopes towards the nose at the cruising attitude of the machine. This is a good point since it reduces the angle of slope when the aircraft is at rest on the ground.

A non-retracting undercarriage is fitted. We have discussed the reasons for this decision with the designers. It is about 400 lb. lighter than a retractable landing gear. It is, of course, a good deal cheaper. It *must* be more reliable, and it *must* cost less to maintain. For long ranges a retractable undercarriage would justify itself, but over the usual short hauls of a freighter the position is different. A fixed undercarriage has two very definite advantages which are not always appreciated. It gives a better take-off (because it is cleaner) and it enables skis or floats to be interchanged with greater ease.

Both the main and the tail wheel oleos use the Dowty liquid-spring shock-absorbing system. Dunlop wheels and tyres, size 48 x 18.00—18, are used at a pressure of 38 lb./sq. in. The wheels are at present in production for military aircraft, but the tyres for the No. 170 will be treaded. Pneumatically-operated twin brakes are fitted. The working pressure is 150 lb./sq. in. The tailwheel is also used in current military aircraft and will operate at the same pressure as the main wheels.

Distances from London by Air (In Miles)

Brussels	200
Paris	205
Amsterdam	230
Berlin	600
Copenhagen	651
Marseilles	658
Prague	680
Vienna	850
Warsaw	920
Budapest	974
Stockholm	1,028
Algiers	1,157
Leningrad	1,350
Moscow	1,600
Athens	1,721
Cairo	2,420
Montreal	2,800
New York	3,000
Karachi	4,880
Rio de Janeiro	5,500
Calcutta	6,386
Cape Town	7,904
Darwin	10,726
Brisbane, Q.	12,754

CARRYINGS BY RAILWAY STEAMSHIPS IN 1938.

	Passengers	Cargo (tons)	Mail (receptacles)
Continent	2,581,000	1,065,000	1,350,000
Channel Isles	291,000	159,000	95,000
N. Ireland	2,240,000	1,351,000	1,134,000
TOTALS	5,112,000	2,575,000	2,579,000

The average weight of mail receptacles is from 33–35 lb. to 40–60 lb.

Pilot and co-pilot-navigator are accommodated above the cargo hold in a position forward of the engines. Dual controls can be fitted, and there is provision for an auto-pilot if required. A large windscreen is provided, with direct-vision panels, glycol spray de-icing and electric wipers. There is a combustion heater at the rear of this cabin. Radio can be fitted to suit customers' requirements.

We were informed that the constructors are prepared to discuss with operators the provision of such special equipment as thermal de-icing for wings, etc., airscrew de-icing, ski or float undercarriages, passenger seating or long-range equipment.

Operating Costs

Anyone who attempts to estimate the cost of operating aircraft in the brave post-war world has our sincere sympathy. Who can say with certainty how much the aircraft will cost? Who can say what fuel and oil will cost, or insurance, wages, landing fees and so on? We can only guess. Some of us think we can guess intelligently. Some of us can only guess!

We had intended just to have a guess when the Bristol Aeroplane Co., Ltd., kindly supplied us with the required information. Here it is: The following basic assumptions have been made:—

Utilisation of aircraft	3,000 hours p.a.
Useful life of aircraft	5 years.
Economic cruising speed (500 b.h.p. per engine 42 per cent. t.o. power)	144 m.p.h.
Size of fleet	10 aircraft.

Fuel consumption 0.426 lb. per b.h.p./hour, with an allowance of 40 gallons for taxi, take-off and climb to cruising altitude (this allowance will vary between 20 gallons and 40 gallons, depending on circumstances). Oil consumption is taken as one gallon to 20 gallons of petrol, with an allowance of one gallon for take-off. Fuel is assumed to cost 1s. 6d. per gallon and oil 5s. per gallon. In calculating payload 60 per cent. reserve of fuel is allowed over the estimated block consumption. Insurance is assumed to cost 10 per cent. p.a. of the original cost of the aircraft and of the crew £5 per cent. of their pay.

VOLUME PER TON WEIGHT (cubic feet)

MACHINERY & PARTS:—		Cotton Shirts	75	**MISCELLANEOUS:—**	
Printing Machinery	140	Woollens in Bales	100	Furniture and Household Effects	240
Aircraft Engines	200	Woollens in Cases	120	General Domestic Earthenware	110
Gramophone Motors	160	Art Silk Piece Goods	100	Confectionery	90
Electric Time Switches	100	Rayon Yarns	100	Paper Literature	60
Motor Car Spares	56	Linen Thread	70	Books	65
Bicycles	90	**LEATHER GOODS:—**		Rubber Tyres & Tubes	120
TEXTILES:—		Chamois	170	Toys and Games	200
Cotton Piece Goods in Bales	176	Gloves	176	Electric Wire	58
		Footwear	160	Cinema Films	55
				Optical Instruments	100
				Twist Drills and Hack Saws	43
				Plastic Powder	70
				Asbestos Brake Linings	80
				Brush Ware	150
				Surgical Dressings	73

CARGO AIRCRAFT

Dimensions :

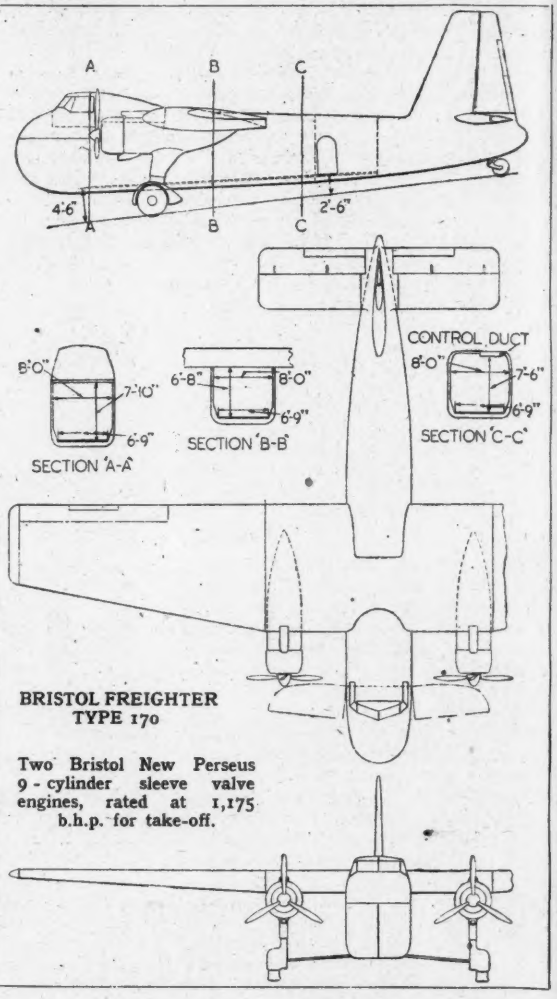
Wing span	98ft.
Overall length	68ft. 4in.
Overall height (over fin)	21ft. 8in.
Wing area	1,405 sq. ft.
Aspect ratio	6.84
Volume main cargo hold	2,020 cu. ft.
Volume rear cargo hold	340 cu. ft.
Main cargo hold, 31ft. 8in. long, 8ft. wide (at 24in. above floor) 6ft. 8in. high (minimum)	
Wheel track	27ft. 6in.

Weights and Loadings :

All-up weight	30,000 lb.
Tare weight	18,455 lb.
Crew (two)	400 lb.
Disposal load	11,145 lb.
Power loading (T.O. power)	12.8 lb./B.H.P.
Wing loading	21.3 lb./sq. ft.

Performance :

Cruising speeds :	
500 B.H.P. per engine (42% T.O. power)	144 m.p.h.
600 ,, ,, (51% T.O. power)	158 m.p.h.
700 ,, ,, (60% T.O. power)	170 m.p.h.
Stalling speed	67 m.p.h.
Service ceiling	16,000ft.
Initial rate of climb	900 feet per minute
Take-off to clear 50 feet	
Concrete runway	650 yards
Grass runway	700 yards
Landing over 50 feet (at 27,500 lb.)	760 yards
Cruising range (standard tanks)	1,400 miles
Cruising height	5,000 feet.



General arrangement drawings, dimensions, weights, loadings and performance of the Bristol Freighter.

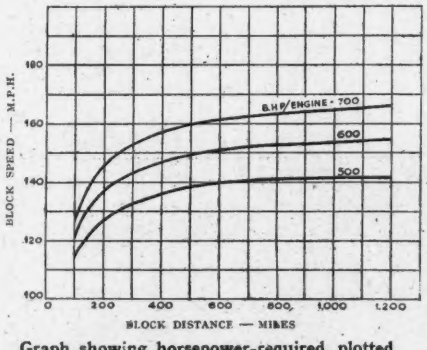
As regards airframe maintenance, estimates based on long experience indicate that the labour required will not exceed one man-hour per aircraft hour flown for a fleet of 10. Taking supervision, stores, etc., into account, it is estimated that the cost per aircraft/hour flown would be about 5s. Provision is included in the estimate for four sets of tyres per annum (£200) and £300 for miscellaneous replacements. Normal daily inspection as well as sparking-plug, magneto and filter examinations at 100-hour periods are assumed. Power plants would be removed for overhaul every 600 hours. Inspection and power plant changes come to an estimated total of 5s. per aircraft/hour flown. The cost of one engine overhaul, including replacement of the usual consumable parts, is estimated at £250; to which is added £150 for replacement of major components. The cost per aircraft for each 600 hours is thus equivalent to 26s. 8d. per aircraft/hour.

Depreciation is the next item. The airframe and airscrews are assumed to have a useful life of 15,000 hours, giving an hourly depreciation provision of 26s. 8d. The useful engine life is taken as 7,500 hours, giving an hourly depreciation provision of 13s. 4d. The cost of airport facilities, ground services, hangars, administrative and selling expenses and other indirect charges will obviously fluctuate widely according to the route, utilisation, block stages, etc. It has been assumed that airport fees will average £6 per landing and that all other expenses will cost £3 per hour flown per aircraft.

For a passenger aircraft the average load factor is generally taken as 65 per cent., but there are no statistics in respect of freight aircraft. In the Bristol Freighter its capacity, i.e., its payload, is limited only by its maximum permissible all-up weight and not by the cargo hold capacity. An average volume/weight ratio for general merchandise is 120 cu. ft. per ton, so that the Bristol Freighter has capacity on a cubic basis for the carriage of nearly 20 tons. The average volume/weight ratio used by aircraft operators is 10 lb. per cu. ft., so that even on this basis there is capacity for more than 10 tons. Both calculations show a considerable margin above the optimum disposable load of 11,000 lb. The designers believe that an average payload factor of at least 80 per cent. is possible of achievement.

In calculating block speeds it has been assumed that 15 minutes will be required for taxi, take-off and climb to cruising height, and that in this time 10 miles will be flown on course. For simplicity of calculation it has further been assumed that the machine will fly at a constant weight of 30,000 lb. and that its speed will not increase with consumption of fuel. Actually it would increase—our Horace says so.

The calculations provide for a utilisation of 3,000 hours per aircraft p.a. We have commented on this factor earlier in our article. There is no reason at all why 3,000 hours should not be flown or even exceeded. It would require proper organisation, day and night services, and a close study by experts of pre-loading into suitable light-



Graph showing horsepower-required plotted against distance and speed.

CARGO AIRCRAFT

Payload and range of the Bristol Freighter (still-air at 5,000ft.) at cruising speed of 144 m.p.h., using 500 b.h.p./engine.

Block Distance	Fuel Used	Fuel Reserve (per cent.)		Payload with		
		60	100	No Reserve	60 per cent. Reserve	100 per cent. Reserve
Miles	Galls.	Galls.	Galls.	lb.	lb.	lb.
100	80	25	40	10,450	10,250	10,150
200	120	50	80	10,150	9,750	9,500
300	160	70	120	9,850	9,300	8,900
400	200	95	160	9,500	8,800	8,300
500	240	120	200	9,200	8,300	7,700
600	280	145	240	8,900	7,800	7,100
700	320	170	280	8,600	7,300	6,500
800	360	190		8,300	6,750	—
900	400	—	—	8,000	—	—
1,000	440	—	—	7,700	—	—
1,100	480	—	—	7,400	—	—
1,200	520	—	—	7,100	—	—

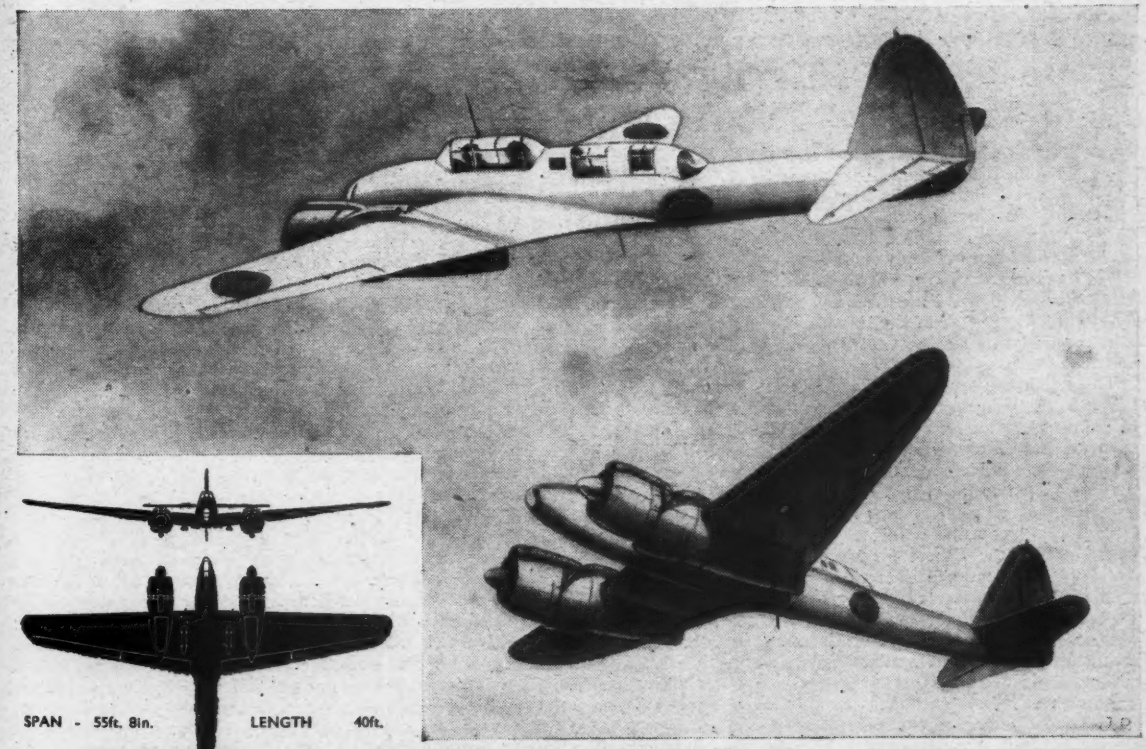
weight collapsible metal containers. The freight aircraft has one advantage over a passenger aircraft in this respect. It can arrive or depart at any hour of the day or night. It is not necessary to study the convenience of passengers. For a fleet of 10 aircraft to achieve a utilisation of 3,000 hours a year each it would be necessary to have a pool of about 30 aircrews.

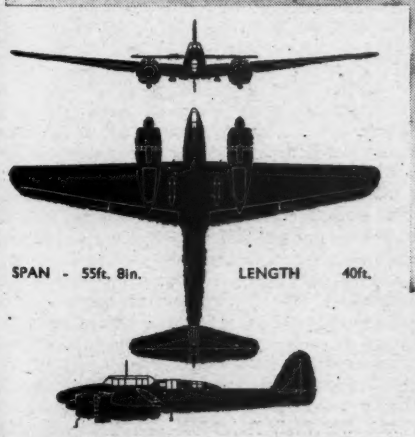
	£ s. d.	Per Hour £ s. d.
AIRCRAFT OPERATING EXPENSES: *		
Flying Operations:		
Pilot		1 0 0
Radio Operator/Navigator		0 10 4
Fuel: 70 gallons at 1s 6d.		5 5 0
Oil: 3½ gallons at 5s.		0 17 6
Insurance of Aircraft, including equipment		0 16 8
Employees' Liability Insurances		0 1 6
Flight Equipment Maintenance:		
Aircraft Repairs, including equipment		0 8 4
Engine Repairs		1 11 8
Depreciation		2 0 0
GROUND AND INDIRECT EXPENSES:		
Landing Fees	2 15 0	
Other Expenses	3 0 0	5 15 0
TOTAL OPERATING COST PER HOUR		£18 6 0

APPROXIMATE COSTS PER TON/MILE

	Still-air Block-to-block Speed	*Cost per Ton-Mile*
All-up weight of 30,000 lb. and payload of 4.2 tons (gross):		
65 per cent. Load factor	132 m.p.h.	12.3d.
80 per cent. Load factor	132 m.p.h.	10.0d.

* Based on 300-mile still-air stages with 60 per cent. fuel reserve.





IRVING II: One of the latest of the Japanese multi-purpose aircraft, this Nakajima product, with the Pacific code name Irving II, falls into the same category as the Ju 88. It is in service as a reconnaissance bomber and fighter. There is also a night-fighter version with a slightly different cockpit cover. Powered by two Nakajima Sakae 21 engines of about 1,100 h.p., it has a top speed of approximately 330 m.p.h. and a maximum cruising range of 1,900 miles. Armament comprises three or four 20 mm. cannon. Empty weight is 10,000 lb.

Aircraft carrier H.M.S. *Indefatigable* passing through the Suez Canal on its way to join the Eastern Fleet. On the deck are Spitfire IIIs and Fireflies.

REPORT ON CARRIERS

Their Good Work in the East : They Constitute 50 per Cent. of British Naval Strength in the Pacific : The Fairey Firefly in Action

By B. J. HURREN

WHEN Admiral Sir Bruce Fraser, C.-in.-C. British Pacific Fleet, said recently in New Zealand that aircraft carriers constituted about half the strength of big ships in British naval forces in the Pacific, he lifted the veil of secrecy which has all too long masked important changes in air power at sea.

We have heard so much of the so-called Forgotten Army in Burma that we have become blinded to a forgotten Navy and Air Forces in the Far East. For evidence exists that carrier-borne air fleets of the Navy will be increasingly in the picture.

The Americans' use of carrier aircraft has made a profound impression on naval and air thought. None of their brilliant operations could have been undertaken without their carrier forces, which have been responsible for all their positive achievements in the Pacific.

Information so far released indicates that the U.S. Navy has more than 100 carriers in being at sea, whilst the British Navy can call on some 50 carriers, the majority of which are of the Escort type of adapted merchant ship. This disparity must arise since the American operations in the Pacific are so completely dependent on sea power, whereas British operations in the Middle East, Mediterranean, Burma and against Germany use the sea as a means of auxiliary communication as opposed to battle action.

Admiral Fraser's statement follows close on news of a series of actions against oil plant in Sumatra. Since December 20th, 1944, four attacks have been made there, culminating in a highly successful blow against the Soengei Gerong refinery on January 29th. Earlier, the Paldjoe and Pangkalan-Brandan (Medan) refineries had likewise been attacked.

The significant thing about these attacks is that they were all made by naval aircraft. It is gratifying to see the new Fairey Firefly is adding to its initial laurels, and took a conspicuous part in the ground-strafe work. These aircraft also acted as escorts to Avenger bombers, and shared the air defence of the East Indies Force warships (the battleship *King George V* and the cruisers *Argonaut, Black Prince, Euryalus* and others) with Seafires, Hellcats and—of course—the A.A. defences of the ships themselves.

Attack by naval aircraft has, in the Pacific zone, become so everyday that the new rôle imparted to a fleet is not generally appreciated. Until this war, sea power was paradoxically at once the most powerful arm and most insufficient. It was most powerful against key ports. In a bombardment of, say, Genoa, Naples or Alexandria, it was without equal in striking power. But such cities as Cairo, Florence, Berlin or any other important centre out of range of guns borne on a sea platform, were immune to naval attack.

Long-range Artillery

The surprise, concentration and punch packed in a fleet's guns has now been extended by naval aircraft. It is quite certain that the series of attacks on the Sumatra oil refineries could not have been mounted from warships alone; and the true effect of the aircraft carriers with the fleet is to "open" the range of attack up to 100 miles inland . . . a factor of tremendous significance against protected harbourages such as Tokyo and as already seen at Taranto.

The value of this extended assault power was of especial import in Sumatra. At the Palembang oil works there was the only machinery in the East Indies before the war for refining fuel for aviation use. Palembang output was computed at 3,000,000 tons of petrol, kerosene, lubricating oils and bitumen; and 80,000 tons of this figure concerned 100 octane fuel. If, as reports indicate, this Sumatra plant was wrecked, it imposes on the Japs the

need to bring low-grade oil to Japan, there refine it, and then ship the stuff all the way back to Malayan centres. The seriousness of this is implicit in the fact that hitherto about three-quarters of all aviation spirit used by the Japs was produced in Sumatra refineries.

It was doubtless because of this that the attacks were closely contested. In the Palembang attack (third in the series) 13 twin-engine and single-engine fighters were shot down and six probables, whilst the ground strafe action destroyed 34 and damaged 25 on airfields ringing the target. Against Soengei Gerong, eight fighters were shot down over the target and three probables, and four were destroyed on the ground. One group of seven aircraft, out to attack the warships, was annihilated. Seafires and Hellcats shot down six in flames and possibly got the seventh.

On the best computation, in these two attacks the Japs lost 99 aircraft, against which our losses were 15. Such figures further refute the obstinate and demonstrably inaccurate contention that "carrier aircraft are inferior to land-based."

From the tactical viewpoint, a remarkable reversal of rôles appears indicated in the composition of the East Indies Force. Its major units announced by name as being present comprised one battleship and the Fleet-type carriers *Illustrious, Victorious, Indomitable* and *Indefatigable*.

Now never before have four large carriers been assembled with a British Fleet force as a squadron operating at sea. In the Mediterranean, the Western forces using *Ark Royal* and *Furious* were virtually distinct from the Eastern, where for a brief period *Illustrious* and later *Formidable* were in harness with the poor old *Eagle* doddering along as best its jellified structure would permit. But here, off Sumatra, we notice four powerful modern carriers, each heavily armed and self-protected with numerous guns and a redoubtable screen of fighters. The united air forces of these ships must have mustered some 200 aircraft.

Change in Ratio

Compare this picture with that so frequently seen in earlier days. Then the picture was rather four battleships and one carrier which—as one tetchy admiral put it—was always getting in the way.

I think the change in value of the carrier is due not only to the astonishing improvement in Fleet Air Arm aircraft, which has followed the arrival at the Admiralty of Vice-Admiral Boyd as Fifth Sea Lord and Commodore Slattery as Chief Naval Representative in M.A.P., but also to the improvement in the ships themselves. Formerly, such ships as the *Courageous* were basically ships-with-aircraft, but the modern carrier is, in clear if not easily explained distinction, an aircraft ship.

The changes in the carriers have resulted in a greatly advanced efficiency. One innovation concerns a movement control officer in each hangar. He acts as a sort of scene shifter director or car park attendant; and if he is sometimes referred to in even less complimentary terms, at least he is playing a vital part in successful operation of a ship's aircraft. Another innovation concerns establishment of an Air Repair Centre, where the stockpile of mechanical skill formerly dispersed throughout each squadron individually is concentrated in an engineers' pool, under an air engineer officer who acts as a labour director and controller on a sort of a job-ticket basis.

Yet another innovation concerns the "dodge-em" car vehicles which move aircraft mechanically about the deck or hangar, where once 59 ginger-headed and horny-handed sailors were needed to man-handle the machines.

Nor do changes apply only to the operational and aircraft side. Messes are vastly improved: each mess of the ship's company in *Indefatigable* has hot and cold water, its own radio and electric heater. Many have special bunks and cushioned seats.

Indefatigable is the latest announced carrier, and the biggest British carrier so far. She is the first four-screw carrier in the Royal Navy, each of her four main engines driving an independent shaft and propeller. With a total of more than 150,000 h.p. available, her speed is much in excess of 30 knots.

In the official account of the Sumatra actions, conspicuous by their absence were the Escort carriers. These have fulfilled a vital rôle in anti-submarine convoy escort work, but it would seem that their usefulness is waning.

Born in emergency, they have the virtues of mongrel breeding and all its failings. There are two main points against the Escort-type carrier for fleet duty. The first concerns seamanship and the second airmanship.

Carrier Aerobatics

The Escort carrier is extremely vulnerable to attack, and its self-protection defences frail. In any sort of sea or wind, the flat-top superstructure adds to rolling and pitching already noticeable in most merchant ships. As one seasick pilot said: "They don't actually loop but they do a beautiful stall turn." In addition, their maximum speed is such that whilst they are suitable for convoy escort duty they are unable to keep pace with a modern Fleet at sea. Furthermore, in conditions of flat or near-flat calm, without wind, to operate aircraft from their decks demands maximum output from the ship's engines and a correspondingly major increase in oil-fuel consumption. One of the inside stories of the war concerns the operation of the Escort carriers covering the Salerno landings: then conditions of flat calm prevailed and aircraft operation was accordingly difficult.

The second thing against the Escort carrier is shortage of deck space for flying-off aircraft. The short run certainly prohibits a large number of, say, fighter aircraft being lined up in readiness for take-off; and the reduction in air readiness is out of proportion to the reduction in size of an Escort carrier compared with a Fleet carrier.

In other words, a new factor enters. In industrial affairs Motion Study and Production Man Hours are factors we have learned to be of vital interest, with Quality Control a very close third. Likewise, in comparing the Escort with the Fleet carrier, there enters a new factor which—to coin a phrase—we may term the Sea Air Ratio.

In the larger carriers, we see some 2 000 men and "x" squadrons of aircraft. These aircraft are supported by an extensive repair and maintenance organisation—spares and unassembled parts may be as much as 60 per cent. of the complement of aircraft in being, assembled. For your 2,000 men at sea you get not only "x" squadrons of aircraft, but a self-contained sea-going air unit which will rely on assistance from the land only for major replacements and repairs. (This applies throughout the entire aircraft side—for example, with torpedoes, rockets, radio and so on.)

Effective Deck-space

Against this the Escort carrier is a very lame duck. Its complement of "y" squadrons is not only numerically a low fraction of the "x" in the Fleet carrier, but the effectiveness of each squadron is reduced by the limitations of deck space for take-off. In a hypothetical case, a Fleet carrier might at one operation have ready lined-up on deck and then fly off two complete squadrons of fighters; an Escort carrier carrying two whole squadrons of fighters could never operate them in one fly-off, and to get the same air concentration of fighters three and possibly four Escort carriers might be needed to match the big Fleet carrier.

Now, four Escorts against one Fleet means a great wastage of manpower. Four Captains, four Commanders, four of each of the executives in all branches; and in the end still short of the essential staff officers borne in the one Fleet carrier.

The Escort carrier must, therefore, rate as rather a lame-duck, a makeshift whose utility is limited and whose absorption of manpower can only be justified in an emergency situation.

On the other hand, it must be equally clear that there is ample scope for a new class of carrier, smaller than the 30,000-ton *Indefatigable*. It will be noted that the

(*Continued on p.* 183.)

"Indicator" Discusses Topics of the Day

Safety First

Hundred per Cent. Regularity Cannot be Expected for Air Transport : Specialised Aircraft for Winter Flying Conditions? : Forming a "Bad Weather Flight"

AT the continued risk of having what I am pleased to think of as a "realism" mistaken for pessimism, I still cannot feel that the average person—or even the average prospective airline organiser—understands fully the effect that bad weather conditions can still have on the continued reliability and regularity of services. So many plans are made and discussed in tones which suggest that the planner has in his mind pictures only of summer or bright wintry conditions, in which ground visibility is never less than a thousand yards, in which frontal zones are clearly defined, and in which ice-forming conditions are found only at certain heights which can be avoided by any well-informed crew.

It isn't, and never was, as simple as that. There are, and will always be, periods in Europe, and in the Northern Hemisphere generally, when flying with fast and heavily loaded aircraft will not be possible with a reasonable degree of safety. Of course, in nearly all conditions it *can* be done. A virile and competent crew can leave A in zero visibility and/or ice-forming conditions, and arrive, if not at B, then at some airfield near to B where visibility is a little better than zero and the ice-forming conditions not so pronounced. The trip may be successfully completed nine times out of ten, but eventually there will come a time when some item of equipment packs up, when the Met. information is a little inaccurate, or when one or other of the members of the picked crew makes a bloomer.

It would be idiotic, particularly while air transport is still tending to remain in its "probation" period, thus to risk the lives of passengers, the valuable cargo and mails, and a good and expensive aircraft. Even these losses are nothing to the loss of prestige involved. If there is any doubt, or if the conditions are such that a hundred per cent. efficiency is required from the equipment or the crew for a successful outcome, then the trip must be cancelled.

Safety in Bad Conditions

Hand in hand with the development of newer and better radio aids, of more efficient de-icing gear, of more reliable equipment generally, and with the training of more expert crews, loading and landing speeds are increasing. Dare I whisper that the most advanced and expensively equipped modern transport, handled by the most experienced crew and directed by the most comprehensive ground organisation, is not much safer in really bad conditions than was a stick-and-wire, draughty, basket-seated, and ill-equipped "air liner" of the 'twenties flown by an experienced pilot of the old-fashioned school? The sleek modern affair, safer by reason of its greater endurance, better equipment, higher performance and more thoroughly trained crew, covers more than twice the distance in the same time both while cruising and while approaching an airfield. The higher cruising speed makes the result of errors all the more serious, and the approach and landing speeds have long ago entered the lethal class.

It is obvious that we cannot retrace our steps, even if we wished to do so, and it would seem that aircraft designers are not yet capable of producing my often-mentioned Jekyll and Hyde aircraft, so it is for the airline organisers to plan furiously in competition with the ever-present weather hazards. They and the designers may, for the present, be beaten by ice and zero visibility, but there is no reason why the passengers should suffer either from the effects of lethal accidents or the boredom of last-minute cancellations.

First of all, I wonder whether it would be worthwhile to a really large airline company to hold in reserve a number of specialised aircraft at every terminal in the form of a "bad-weather flight"? The idea may, at first sight, appear to be fantastic, and would certainly involve the concern in a still greater capital outlay, which might or might not offer an eventual return. But there is no doubt at all that designers and manufacturers are perfectly capable of such a type at the cost only of a lower cruising speed. It would be designed, as Number One Priorities, with low approach and landing speeds and with exceptionally safe low-speed and stalling characteristics. These features would be followed by elaborate ice-prevention and/or removal systems, and by the incorporation of the most thorough and up-to-date series of radio aids. It would probably need to carry a larger crew than usual, and if all this could not entirely be offset by a lower performance, then even the passenger load must be sacrificed. Specialised and well-rested crews would stand by to take over the traffic when necessary, and to make any trips for which the particular capabilities of the type suited it.

Delays of Moment

Such a "bad-weather flight" arrangement would not, of course, permit a hundred per cent. regularity, but it would enable services to be continued on many days when common sense would dictate a cancellation with faster and more heavily loaded types. Nor would this arrangement help much where long-distance services were concerned. But it is reasonable to suppose that for any scheduled run longer than, say, a thousand miles—and particularly when such a service involves a longish sea passage—the delay of a day or two would be of no great moment to a passenger. The meteorological people, through the traffic department, would be able to inform the passengers of the likely period of the delay and they could choose for themselves whether to ask for transfer tickets.

Which brings me to the second point—that complete and thorough bad-weather alternative travel arrangements must be capable of being put into action immediately at the discretion of the passenger or the recommendation of the traffic office. "The service will not be running to-day, and the Met. people tell us that these ice-forming fog conditions are likely to last for at least forty-eight hours and to cover all the home terminals. I suggest that your best alternative route is by ..... Here are your tickets....." That sort of thing. There must be no trouble, no delay, and no added expense. Each service, particularly during the winter months, will have, in the traffic officer's mind, a "twin" counterpart involving the best and fastest that can be offered in the way of surface transport.

Hundred per Cent. Bullying

Even in the present advanced state of operational development, no operator must be allowed to imagine for a moment that he will be able to run to a hundred per cent. schedule, or that such a standard can, so to speak, be bullied out of his aircraft and crews. No prospective passenger must be allowed to foster the idea that "the airline always gets through." Nearly all the major airline disasters of the years preceding the war were directly or indirectly caused by over-enthusiasm and over-confidence on the part of operators or crews, and by this growing passion to show the public that air transport could be as punctual and reliable as a train service on London's Underground. It

SAFETY FIRST

couldn't be, and I doubt if it ever can be—but it has other and more important advantages to offer.

At the price of, at the most, a ten per cent. failure to hold a schedule, air transport offers comfort, simplicity, speed, and a whole host of other less tangible advantages which can only be appreciated by the habitual air traveller. Let us not risk the addition of danger to the debit side by striving after the impossible. All I suggest—if it is not possible to start all over again with our conception of a good transport aircraft—is the development of a safer, more easily controlled, and more carefully directed transport type for operation in border-line weather conditions over comparatively short routes. Such a reserve aircraft might considerably help the maintenance of schedules and, if schedule-keeping continues to be the ruling passion of operators, it will keep down the proportion of fatal accidents. In the meantime, let safety be the primary aim.

"INDICATOR."

REPORT ON CARRIERS *(Concluded from page 181)*

official wording of the speed of the *Indefatigable* says "... of considerably more than 30 knots."

Big aircraft carriers—the Americans have mentioned three of 45,000 tons—are exceedingly complicated to build and operate. But as with the heavy and light cruiser classes, it seems a strong case can be made for a carrier of some 20,000 tons and at least "of considerably more than 30 knots" which will meet the objections to the temporary escort carriers.

These ships would plainly need extra deck space to make possible squadron operation. This would enable sufficient fighter protection to be flown off in one operation, thereby largely obviating the need for such additions as numerous gun batteries and armoured decks, as found in the big carriers.

Indeed, since the trend for more carriers per fleet has so far advanced, the composition of a future fleet might well comprise one major carrier of 30,000 tons (or more), supported by a new class of smaller tonnage, high-speed, 20,000-ton or so scaled-down versions carrying at least the same numbers of aircraft and having the same deck space as the bigger brothers.

Such an addition would very materially advance air power at sea, and would banish many anomalies.

However, wars are won by men rather than materials. And coincident with material improvement there can be seen a change of outlook in the Navy itself. More and more sea-going Captains are having or have had direct contact with the air side, and this—despite the cheap gibes of sea and air diehards—is all to the good.

It must be remembered that in the Navy itself have grown up in aviation officers now of Captain's rank. But the qualities which urged them to go flying in the dangerous days of their youth do not necessarily qualify them for command of a major warship, primarily as seamen. On the contrary, the cool and calculated daring of such non-aviator officers as Admirals Vian and Somerville seems to derive from their understanding of air power and a clear grasp of the extent and limitations of aircraft which they use as a background to their sea knowledge. These qualities are only engendered by long years at sea. The unfortunate fact is that many of the rising tide of naval flying officers have had to sacrifice so much of their sea experience in order to acquire aviation experience.

So that if, as a matter of high policy, it must be recognised that some of the aviation-bred naval Captains cannot have their cake and eat it, at least it is encouraging that war actions have shown the purely sailor Captains that they can, with advantage and increased efficiency to the Fleets, trim the sails of the die-hard principles of British XVIIIth and XIXth Centuries navies to the aeronautical factors and needs of the XXth—and after.

DEATH OF MR. A. DUCKHAM

ALEXANDER DUCKHAM, founder and governing director of Alexander Duckham and Co., Ltd., and chairman and governing director of The Trinidad Central Oilfields, Ltd., who died recently after an operation, had a long and close connection with aviation. He took up flying in 1910 and became a close friend of M. Louis Blériot. It was he who provided the memorial stone at Dover on the spot where Blériot landed after his cross-Channel flight in 1909. Apart from his connection with the aircraft industry through his oil business, Mr. Duckham became known to the Royal Air Force for his great work on behalf of the R.A.F. Benevolent Fund, for which he often pleaded and to which he contributed not only money but Vanbrugh Castle, Blackheath, and Rooks Hill House, Sevenoaks, which he presented for the benefit of orphans of R.A.F. personnel, together with a grant of £1,000 a year towards upkeep.

Mr. A. Duckham.

"LOCAL" DELIVERY!

A LETTER posted in London was delivered at Gibraltar on the following day recently.

It was one of many thousands to be flown from the United Kingdom to the Forces overseas by aircraft of R.A.F. Transport Command. All Transport Command aircraft flying on overseas routes now carry troop mail which enjoys an overriding priority.

The Command's postal network extends over more than 100,000 miles of regular routes from Canada to India, and it is not unusual for a letter posted in Montreal to arrive at its destination in England three days later.

AUSTRALIAN BUSH FIRE DANGER

SPECIAL Australian reconnaissance aircraft are patrolling bush fire danger areas in the Commonwealth. Forestry Commission spotters travel in the aircraft to direct ground activity by radio. Aircraft on training and travel flights are on the alert to report outbreaks.

Supply-dropping to people trapped by fires, and in areas where ground communications are difficult, are other phases of the work of Australian aircraft in helping meet the bush fire menace. The Volunteer Air Observers Corps (the Australian counterpart of the Royal Observer Corps) is also co-operating.

S.L.A.E. PROGRAMME OF LECTURES

THE following programme of lectures has been arranged by the Society of Licensed Aircraft Engineers for the rest of February and the first week in March.

February 15th—Prestwick (Prestwick Airport). Lecture with Sound Film: Principles of the Construction, Adjustments and Operation of the Hydromatic Propeller. Time, 7 p.m.

February 16th—Perth. Lecture with Sound Film: Principles of the Construction, Adjustments and Operation of the Hydromatic Propeller. Time to be announced locally.

February 17th—Aberdeen. Lecture with Sound Film: Variable Pitch Propellers. Time to be announced locally.

February 19th—Yorkshire (Brough). Lecture with Sound Film: Principles of the Construction, Adjustments and Operation of Hydromatic Propellers. Time to be announced locally.

February 20th—Derby (Derby Airport). Lecture with Sound Film: The Principles of Construction, Adjustments and Operation of Hydromatic Propellers; at 7 o'clock.

February 26th—Wolverhampton (Airport Concert Hall). Lecture with Sound Film at 7.30 p.m.

March 3rd—Hendon. Lecture with Sound Film: "Trend of Design and Development of Variable-pitch Propellers." By A. V. Cleaver. Applications for admittance to be made before February 28th to Society, 224, Regent Street, W.1.

March 3rd (approximately)—Durban. Lecture: Propeller Design Prospects. Exact date and time will be announced locally.

CIVIL AVIATION NEWS

AFRICAN AIR TALKS

A REGIONAL Southern African air transport conference is to be held in Capetown towards the end of March, probably on March 20th.

Britain and Southern Rhodesia will be represented, and Kenya, Nyassaland and other British African territories are being invited to participate.

The conference will be devoted to a detailed discussion of problems connected with Commonwealth trunk routes and feeder network.

Discussion with Portuguese East and West Africa and Belgian Congo, which are not participating at the conference, are expected to take place at some later date.

AIRPORT FOR NORTH-EAST

A NEWCASTLE conference decided on further steps towards the provision of an airport for the North-East.

Local authorities and industrialists agreed that a prominent firm of airport consultants should be engaged to make a detailed survey of the region so as to advise on the position of an airport and on its size and scope. The possibility of a combined land and seaplane base will also be considered.

The project was first launched some four months ago at a meeting of northern local authorities in Sunderland, convened by Lord Londonderry, Lord-Lieutenant of County Durham.

U.S.—EIRE

ACCORDING to the Air Transport agreement concluded between the U.S. and the Eire Government, authorised airlines of the United States are accorded in "the territory of Ireland" rights of transit—non-traffic stop, and commercial entry for international traffic at the Shannon Airport (Foynes and Rynanna) on the routes from the U.S. to Ireland and countries beyond via intermediate points in both directions. All eastbound and westbound aircraft on the routes concerned should stop at the Shannon Airport as the first and last European port of call.

Airlines of Ireland authorised under the agreement are accorded in the territory of the U.S. rights of transit, non-traffic stop, and commercial entry for international traffic at specific airports "in connection with such route or routes as may be determined at a later date."

Aircraft which have to make non-traffic stops may be required to offer reasonable commercial service in passengers, cargo, and mail, both outwards and inwards.

The commercial rights granted by the agreement are to be taken up at earliest practicable date "except in the case of temporary inability to do so."

The proposed services are not detailed. They will come into operation as soon as the contracting parties have authorised the airlines for the route.

Operating rights granted previously by either party are to continue in force.

The agreement also provides for the most-favoured-nation treatment to fuel and parts imported by either party for the sole use by authorised airlines, and an exemption from Customs duties of equipment, fuel, etc., retained on board of aircraft.

RECOMMENDED

THE U.S. Chamber of Commerce advocates the acceptance by the U.S. of the agreements on international aviation proposed by the Chicago Conference "as opening the way for the prompt development of international aviation and helping to bring about the widespread extension of trade and commerce throughout the world to the benefit of all participating countries."

The Chamber is submitting its recommendations to the Senate Committees at present examining the agreements.

EGYPTIAN POLICY

IN the Egyptian Chamber of Deputies, Prime Minister Ahmed Maher Pasha said that Egypt's post-war aviation policy will not tolerate foreign owned airports on Egyptian soil. Airfields would be Egyptian owned but foreign Governments and companies would be allowed to use them.

The statement was made in reply to a question by a Nationalist deputy alleging that the U.S. propose to maintain the present airfields in Egypt for civil and international police aviation after the war.

CANADA WANTS EXPORTS

A SURVEY of export possibilities of the Canadian aircraft industry was recently completed by the Air Industries and Transport Association of Canada.

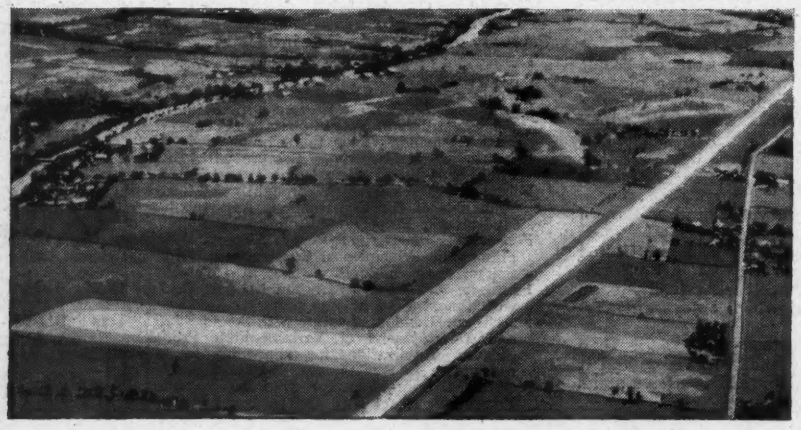
The findings are the subject of a memorandum submitted to the Government by R. B. C. Noorduyn, president of the Association, and supplemented by a brief on the Customs tariff relating to the aircraft industry, which was submitted to the Government in June, 1944.

In the previous brief it was submitted that provision should be made in Trade Treaties for preferential tariff treatment on aircraft produced in Canada; that a protective duty should be maintained by Canada on aircraft and substantially complete components; and parts, materials and components not made in Canada should be exempted from duty. On the same grounds a revision of the rate of duty was recommended for aircraft of a type or capacity of which no equivalent is manufactured in Canada.

Two outstanding facts are pointed out in the new survey; in the first place, the benefit of free importation of aircraft into Canada is granted by Canada to seventy-seven British countries, whereas forty-six British countries extend to reciprocal privilege of free importation of Canadian aircraft. Of these countries which extend no preference in tariff on aircraft, several constitute an important part of the Empire from the standpoint of export trade, such as Newfoundland, Union of South Africa, Southern Rhodesia and British India.

The second fact emerging from the survey is that while the tariff rate on aircraft imported into Canada from the United States and from twenty-four other foreign countries under the Most Favoured Nation treatment clause is 20 per cent., none of these countries, with one exception, grant Canada any tariff preference on aircraft or aircraft parts. As an instance the Canadian rate of duty on aircraft imported from the United States is 20 per cent., and on aircraft parts ranges from "free" to 15 per cent., while the American duty on Canadian aircraft and on complete parts exported to the United States is 30 per cent.

These factors have prompted the industry to urge that negotiations be entered into with foreign countries which enjoy Most Favoured Nation treatment, and with others, with a view to securing reciprocal tariff preferences on aircraft when exported to such countries.



FLIGHTSTOPS: Runways built along highways, equipped with telephones, rest rooms, automatic fuel pumps are planned by the U.S. Aeronautical Chamber of Commerce in their countrywide campaign for the expansion of landing facilities for the private owner. The Chamber urges the construction of several thousands of "Flightstops" during the next five years.

CIVIL AVIATION NEWS

SCOTS DISTURBED

VISCOUNT SWINTON'S statement to a deputation of Scottish M.P.s that Prestwick is not to remain the country's chief transatlantic airport seems to have nettled Scotsmen of every shade of political opinion.

It is also complained that the proposed railway air network plan does not provide for a direct connection between Scotland and continental Europe. Even to Northern European capitals Glasgow businessmen would have to travel by train to Edinburgh, from there to Newcastle and then fly back past Scotland to reach Scandinavia.

U.S. AIRCRAFT SALES

DOUGLAS Dakotas and Lockheed Lodestars are now being offered from surplus stock to airline operators in this and other countries by the U.S. Mission for Economic Affairs.

A circular issued by the U.S. Embassy to British and foreign air transport companies in this country gives the maximum price for the Dakota as £25,000 and for the Lockheed £17,000.

The offer is in accord with the previously announced U.S. policy to make transport aircraft available to all interested parties and has already been extended to a number of countries, as, for instance, Belgium, France, Turkey, etc.

But the chief selling point in the proposition is not only that airline operators have an opportunity to secure aircraft when no other sources of supply exist, but to make it even more attractive, the Americans are willing to undertake the substantial reconversion work on these aircraft from military to civilian air transports.

NORWAY SIGNS

A SPOKESMAN at the Norwegian Embassy in Washington recently told Reuter that M. Wilhelm Munthe de Morgenstierne, the Norwegian Ambassador, had signed, at the State Department, documents drawn up at the Chicago Civil Aviation Conference.

They covered the interim agreement, permanent convention and "two freedoms."

The interim agreement reached by the International Civil Aviation Conference, which concluded at Chicago on December 7, provides for the establishment in Canada of a provisional organisation until the permanent convention—the international civil aviation organisation—is set up.

Under the "two freedoms," each State which signed the International Air Services Transit Agreement permits aircraft of other contracting States to fly across its territory without landing or to land for non-traffic purposes.

AIRBORNE LETTUCE

A SURVEY conducted by Detroit's produce merchants in conjunction with the Department of Agriculture revealed that lettuce could be flown from California to Detroit at a cost of approximately 3¼ c. (about twopence) above that of the railborne product and the speed in transit would be 17 times greater than by rail.

The report found consumers willing to pay that bit extra for a fresh lettuce.

FROM LATIN AMERICA

AS far back as September, 1935, the Argentine Government passed a law providing for the establishment of a central national airport. The proposals foreshadowed an airport situated within the city boundaries of Buenos Aires and accommodating both land and sea aircraft.

Three separate plans were subsequently drawn up and dealt with three different sites. But studies revealed that all three would need considerable levelling and require a long time for the land to settle.

These plans have therefore been abandoned, and it has been decided to plan and establish an airport for landplanes only at Seis de Septembre, to the southwest of Buenos Aires.

The site is situated about 15 miles from the centre of the city, and traffic to the airport will be given priority over other road traffic, to allow the former to do the one-way journey in thirty minutes.

Chile is planning the construction of several new airports at a cost of over £150,000.

A government-controlled airport and aviation company in Peru is to make and manage airports. One of the first airports to be established will be located on a high plateau on the western slopes of the Andes near the capital, Lima. This airport is to cost nearly £50,000.

SAFETY

RECENT safety statistics reported by the Civil Aeronautics Authority confirm the airline safety record.

The average yearly number of passenger miles flown for each passenger fatality by U.S. scheduled home airlines from 1932 to 1937 was 13,725,096. For the following six-year period, 1938-1943, the average was 47,772,014, or an increase of more than 250 per cent. in the average number of miles flown per passenger fatality.

N.Z. PREMIER'S DENIAL

MR. PETER FRASER, the Prime Minister, denied an Australian report that the Australian and New Zealand Governments had reached an agreement to nationalise the internal airlines of both countries. Mr. Fraser said the question had never been the subject of an understanding or of discussion between the two countries, as matters relating to internal economy and the industrial organisation of the country were not fitting for discussion between the Governments. The points of agreement reached, said Mr. Fraser, were confined entirely to international and British Commonwealth aspects of aviation.

CHEAP RATES

AN offer of "mass passenger transportation" across the Pacific in less time and at lower rates than minimum first-class passenger liners has been made by Pan American World Airways in their application to the U.S. Civil Aeronautics Board, as briefly mentioned on this page last week.

Some further examples of proposed fares for single journeys from San Francisco or Los Angeles, with 1938 2nd Class and Tourist shipping fares in brackets, are as follows: To Auckland via Honolulu $292.50, about £73 ($218—£54); to Calcutta via Tokyo $393, about £98 ($336—£84); to Canton via Tokyo $321, about £80 ($215—£54); to Shanghai via Tokyo $303, about £76 ($200—£50); to Singapore $339, about £85 ($240—£60); and to Tokyo via Midway $271, about £69 ($175—£44).

"CHOSEN INSTRUMENT"

THE formation of a company to be the "chosen instrument" to handle America's foreign commercial air routes after the war is urged by the Senate Aviation Sub-committee.

Details "leaked" from the confidential draft report say that the Committee proposes that stock in such a company should be held by Pan American Airways (the nation's biggest foreign airline), domestic airlines, railways and shipping companies.

The company at all times and in all respects should be subordinate to the Government and its interests.

"We recommend a minimum of American flag carriers—even just one—in the foreign field and the highest degree of regulation in the public interest," the report says.

In the domestic airline field the report stated: "We have all the restraints of national power necessary to prevent monopolistic wrongs. To grant an operating licence to one railway or steamship company would be an open door to prolonged experience in cut-throat competition, impairing the safety of travel and culminating in endless subsidies."

The report, however, favours services to Mexico, Cuba and Canada by domestic operators, by reason of the proximity of these countries.

The Committee bases its report on the estimate that in 1950 the U.S. share of international air traffic will be 1,550,000,000 passenger miles and American domestic traffic 7,000,000,000 passenger miles.

It is recalled that last August Mr. Cordell Hull, U.S. Secretary of State, opposed any monopoly policy, saying that the experience of most other countries which had adopted a monopoly or chosen instrument policy had been that such a policy led to a government-owned system or one so completely government controlled as to have all the qualities of government ownership.

The Aviation Committee, consisting of nine Senators, with Senator Josiah Bailey as chairman, is not unanimous on the report. Senator Head, of New York, supports a plan for a number of airlines operating in different zones on overseas routes.

A major clash is foreshadowed on this issue between the Administration and Congress, but a later comment in the *American Aviation Daily* states that there is a strong reason to believe that the Committee's proposals are as good as dead as a result of a meeting between the Aviation Sub-committee of the Senate and Government officials. The paper adds that it appears unlikely that the report will be ever issued.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE LINK WITH HOME

Appreciation from an R.A.F. Officer in Texas

FROM Laredo Army Air Field, Laredo, Texas, U.S.A., comes the following airgraph:

"You have no idea how much at home I felt when I found that *Flight* arrived regularly every week at this U.S. Army Air Corps station, which is a stone's throw from the Rio Grande, the U.S.-Mexico border. The Technical Library has been receiving it for many months now, and it is extremely popular, even though the issues are six weeks old (or more) when they arrive. But to me—the only R.A.F. "type" for 150 miles—it is a grand link with home, and I look forward to its arrival with even more eagerness than on Friday mornings in a crowded R.A.F. Mess. With kind regards."

D. H. BIRD (Sqn. Ldr., R.A.F.).

CROPPED AIRSCREW BLADES

—Versus Bent Metal Ones

WITH reference to the letter in *Flight* of January 18th under the heading "Cropped Airscrew Blades," you might find this worthy of publication.

Mr. V. H. Izart in a recent letter (*Flight*, January 18th) expressed an opinion that wooden airscrew blades might have an advantage over metal ones, in that, on striking the sea when low flying, they may snap off evenly, enabling the pilot to return to base on the remaining stumps. He may be interested in the following experiences with metal airscrews.

First, a friend of mine on daylight operations in the Western desert in a Blenheim I, which had no under-gun, was trying to prevent a C.R.42 from getting under his tail. Flying at maximum boost and minimum altitude there was a loud bang and 500 more revs on each engine. Otherwise (apart from the C.R.42) everything remained quite normal. On landing at base, 6-9in. of all six airscrew blades were found to be bent forward at right angles.

Secondly, due to lack of spares whilst detached for operations, a friend of mine flew for three weeks with 6in. of one airscrew blade bent over at right angles and a bullet hole through the other. He said that apparently it was just as good as new.

Lastly, can anyone tell me the answer to this one? The tip of a metal airscrew blade on striking an obstruction whilst under power bends forward. Taking an average figure for slip in the air of the tip of an airscrew blade under power, my slide-rule says that if it strikes an obstruction *once only* (e.g., the top of a bank, a tree stump, etc.), it should bend forward about 60 deg. It doesn't. It bends forward 90 deg. Why?

"AGED."

ORGANISING FOR EFFICIENCY

Air Travel Means Selling Speed

THROUGH the courtesy of your columns I would like to thank Capt. K. Bartlett, of the Bristol Aeroplane Co. (*Flight*, February 1st), for correcting my quoted cruising speed of 130 m.p.h. for the Bristol Freighter. The speed given by the aeronautical Press on the release of details of this aircraft was 130-150 m.p.h., and it was therefore assumed that the economical cruising speed would be 130 m.p.h. With an economical cruising speed of 170 m.p.h. this aircraft should prove to be of far more value to the operator.

Referring to my sweeping statement that it is useless to design aircraft with a cruising speed of 130 m.p.h., as they simply cannot cope against strong headwinds, I admit that it is sweeping, but contend that it is nevertheless true. Mr. Bartlett's reference to aircraft operating on our Empire routes prior to the war at cruising speeds below this is in itself justification for my statement because, if he cares to check the regularity of that service, he will find, in spite of the short hops involved, there were numerous cases both of cancelled flights and aircraft being forced to turn back to their starting base, due solely to their inability to make the stage against adverse headwinds.

Mr. Bartlett's summing up of the aircraft-operating requirements is sound, but surely the Bristol Aeroplane Co. do not believe that "such a combination cannot be achieved at high speeds." We must realise that Britain can only lead in the air race by remembering that air travel for passengers or freight means selling speed.

Firms interested in air freight are interested essentially in getting their products on the market first. At 130 m.p.h. adverse winds can lengthen the time in the air by 60 per cent., whereas at 200 m.p.h. this time in the air against the same wind is only increased by 30 per cent. A marked saving and, if by cleaning up the aircraft, this increase in speed can be gained for the same power output, then an increase in structural weight is permissible since less petrol will be required for the trip, and petrol, besides pushing off your payload, costs money itself. Surely in 1945 retractable undercarriages should be no more difficult to maintain than the fixed type.

It would be most interesting if the Bristol Aeroplane Co. could supply full details of the operational costs of their Freighter on which the figure of 1s. per ton-mile is based.

COL. A. RICHARDSON.

[This information is actually given on page 179 of this issue.—ED.]

ABOUT AMPHIBIANS

Wheels Retracting Into Floats

WITH reference to the letter from Mr. Hancock (*Flight*, January 18th) and that of Mr. Payne (*Flight*, February 1st), I would suggest that it should not be difficult to deal with the matter of housing the landing wheels within the float.

The wheels could be fitted to hydraulic struts, and these could be arranged to swing up into pockets on the under-side of the float, in the usual manner of retractable undercarriages on land-based aircraft. This should solve the problem of "wheel-travel" mentioned by Mr. Payne.

If this float-wing could be made quite deep between leading edge and trailing edge, it could be fitted with four wheels, two in front and two at the back, thus forming a sort of quadricycle-undercarriage. The rear pair could be castor-wheels, so as to facilitate turning when on land.

This arrangement would give the machine a horizontal standing position on both land and water. This standing position is, I understand, an advantage in taking-off and in landing.

W. ADAM WOODWARD.

IMPLICATIONS OF V2

Reality versus Mysterious Calculations

A GOOD deal has been written about the implications of the V2. If it were capable of a higher performance, surely the Germans would do something about it. They could use less fuel and more explosive or, alternatively, they could range over a wider area or else move their launching sites to places less easily accessible to our fighter-bombers. The outstanding implication seems to be that the V2 is doing all that can be got out of it.

What it actually does is to range about 200 miles, and to do that it must have a velocity of about 3,700 m.p.h. at the end of its power flight. Allowing that a certain amount of power is absorbed in making the turn, it may be capable of perhaps 4,500 m.p.h. in a straight vertical ascent.

Estimates as to its possibilities ignore the implications of its practical achievement and show by mysterious calculation that it should be capable of an easy 10,000 m.p.h. without making any essential modification in the design.

Mr. Burgess gives the initial and final accelerations as 1.17g. and 6.4g. respectively. Anyone can work out that such accelerations would give nothing like 10,000 m.p.h. It is not difficult to show that the final acceleration would have to be more than double 6.4 g., and that would involve a thrust that, in turn, would require a fuel efficiency of more than 100 per cent.

Now let us consider the work done by the fuel. There is an excess of alcohol, so that only 7¼ tons is effective. This has a work equivalent of about 22 million ft./tons, and at 50 per cent. efficiency there would be about 11 million ft./tons. The rocket, as everyone knows, is a very inefficient engine at low velocities. Even after it has got well started its fuel efficiency is less than 10 per cent. The German rocket 'planes are so inefficient that they can only stay in the air for a few minutes. It is not until a very high velocity is reached that the work done approaches the theoretical energy of the fuel expended. It is clear therefore that nothing like the 11 million ft./tons is turned into effective work. To raise the dead load of the bomb absorbs millions of ft./tons of energy. In addition, all the fuel (including the excess alcohol and the fuel for the turbine) absorbs its kinetic energy before it is dis-

charged. This accounts for even more energy than the dead load lift. In fact, most of the energy of the fuel is expended in merely getting the V2 up to the 100-mile mark. What is left is represented by the kinetic energy in free flight of the hypothetical V2, and this, at 10,000 m.p.h., amounts to more than the original 11 million ft./tons.

"Escapist" goes one better and visualises a 10-ton rocket having a thrust of 50 tons maintained for three hours. The only difficulty is that the 10-ton rocket would have to carry a load of about 3,000 tons of fuel.

The reasonable conclusion appears to be that the actual performance of the real V2 is the most reliable guide to its possibilities. R. PARBURY.

Orbital and Escape Velocity

"ESCAPIST" (*Flight*, Jan. 25th.) is puzzled by the difference between "orbital velocity" and "perpendicular escape velocity." A body in an orbit is still bound to the earth and has not yet completely escaped. It is in a state of stable equilibrium between gravity and centrifugal force. When escape velocity is reached the equilibrium is broken (it does not matter whether the velocity is then vertical or horizontal). Escape velocity is therefore greater than orbital velocity, actually in the ratio 1.414 : 1. Both velocities diminish inversely as the square *root* of the distance from the earth's centre.

"Escapist" is correct in thinking that the reduction of weight of a body at the equator is due to the earth's rotation, though the flattening of the globe at the poles is a contributory factor. ARTHUR C. CLARKE, B.I.S., C.B.A.S.

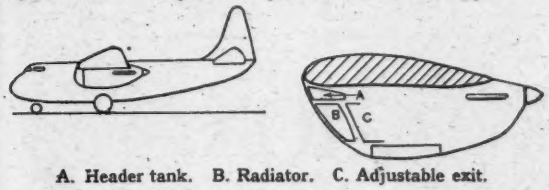
A CIVIL POWER PLANT

Advantages of Pusher Installations

I HAVE followed with interest the discussion following Mr. C. A. H. Pollitt's article on engine installations.

I agree with his basic suggestion that the engine be installed as far as possible below the wing. However, I think the principle lends itself more readily to a pusher installation as in Fig. 1.

Further, if the components in question were situated as in Fig. 2, the following advantages would, I think, appear.



A. Header tank. B. Radiator. C. Adjustable exit.

1. The question of the distance between the airscrew and leading edge does not arise. The air flow over the wing would certainly be further improved.
2. The header-tank and radiator installation is simplified.
3. It is as accessible as Mr. Pollitt's layouts.
4. I do not think it interferes with the principle of quick removal as a complete unit.

Perhaps the most serious defect would be flap-airscrew interference; unfortunately, I have no data on this.

An interesting point is the possible effect of the exhaust on airscrew icing. D. POW (Flt. Sgt.).

Some Undesirable Aspects

MR. POLLITT'S article, "A Civil Power Plant," recently published in *Flight*, whilst being seemingly sound in principle, gives ground for much criticism.

First and foremost, it is quite obvious that the engine mounting, picking up on the wing front spar as suggested, would be quite inadequate to support the weight of the complete power plant without additional longitudinal stabilising struts, and the two-point suspension would give rise to serious side loads due to torque reaction unless counter-rotating airscrews were employed. Furthermore, it would seem that the spar would transmit to the fuselage very undesirable vibrations which would be detrimental to the comfort of passengers unless large vibration insulators were incorporated.

Presumably, it is intended to build the power plant round a two-stage Merlin engine as the diagrams suggest. Assuming this, the radiator, oil-cooler and inter-cooler radiator, whilst giving satisfactory accessibility from the top of the wing, would necessitate a considerable increase in the amount of piping compared with that required on the conventional underslung types. This is due to the relevant pumps being situated low down on the rear half of the engine and driven off the main gear-train in the wheel case. The advantages gained by eliminating the intermediate structure would thus tend to be offset by the increase in weight of piping and the additional coolant required.

The undercarriage on a typical inboard power plant, when retracted, would require additional space, as the wheel is shown passing in between the two legs which is not practicable as cross-bracing would most certainly be required. An increase in the length of the nacelle would thus be a natural assumption involving additional weight and wetted area.

Mr. Pollitt's argument that a large decrease in the length of the nacelles would be possible with the proposed power plant is not strictly true, as the outboard nacelles on the Lancaster, which he uses for comparison, terminate approximately half-way along the chord of the wing. The attached sketches indicate that little advantage is gained, particularly on the outboard nacelles.

Lancaster in solid line and the proposed outline dotted.

Finally, the suggestion that the reduction gear casing could be extended to avoid propeller interference over the wing leading edge would materially increase the engine weight whilst further increasing the length of the cowling; another undesirable feature as weight economy is an important factor.

E. S. C. P.

Clearing Up a Couple of Points

I SHOULD very much welcome the opportunity to try to redeem myself in the eyes of Mr. C. A. H. Pollitt. I am more than slightly amazed that so much misunderstanding could have arisen.

There are two points which I wished to make in my previous letter. I would like to set them out separately now.

A. First one is: that an airscrew should be mounted approximately one-third of its diameter ahead of the leading edge of the wing. I did not mention the Mosquito in this connection, nor the Beaufort. For examples, I suggested that the Typhoon and Flamingo appear to be border-line cases.

B. Secondly: that overall length of the nacelle should be considerably greater than Mr. Pollitt portrayed in his sketches. To support long nacelles, I mentioned the extension to the Mosquito's nacelles, and the trouble with the Beaufort's short nacelles. I did *not* wish to suggest that the extension to the Mosquito's nacelles was occasioned by bad positioning of the airscrew.

So much for those two points.

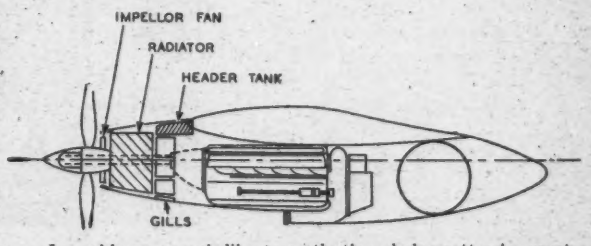
C. In your article you mentioned that your nacelle was to be entirely underslung. On this point I support you.

D. Furthermore, you advocated placing the engine below the main spar of the wing. On this also I agree that it is advantageous.

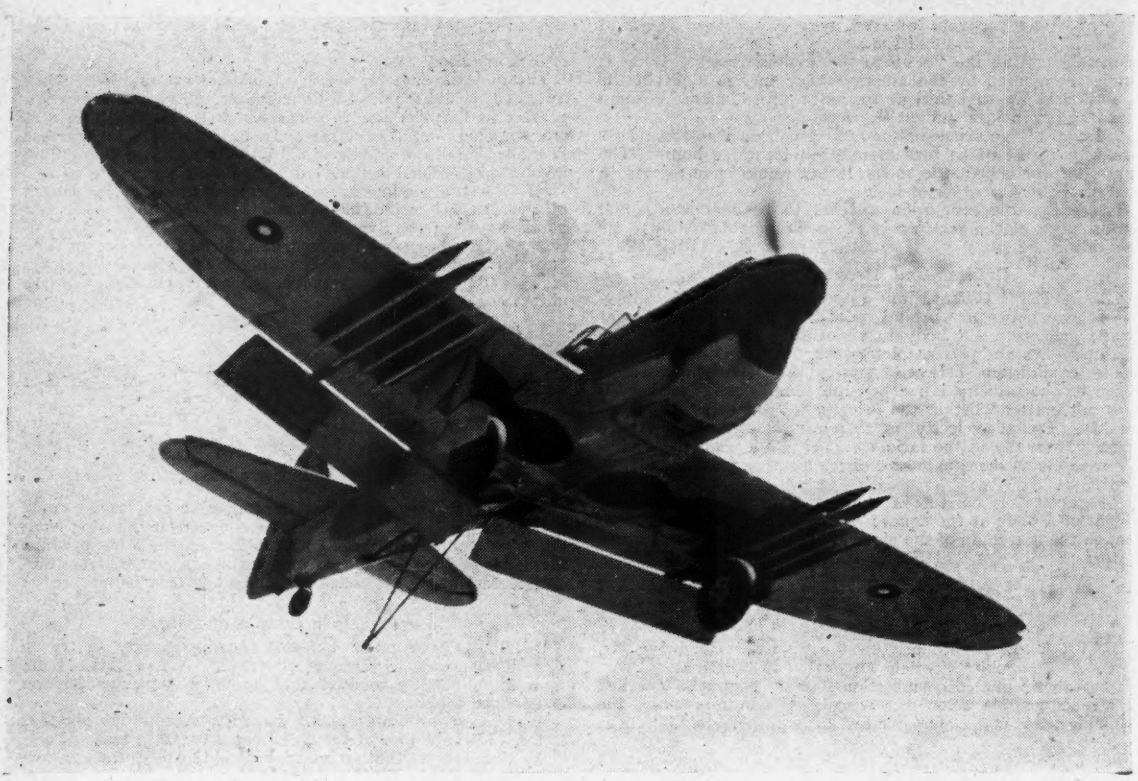
Combining my point A with your C and D, we must have a longer nose to the nacelle. This, unfortunately, will scarcely be possible without the complications of an extension shaft for the airscrew.

It will be seen that if we *do* extend the nacelle forward to satisfy point A, we are increasing the overall length—and hence point B is satisfied, in part at least. If it should still be necessary to add more overall length, then this further addition could be made at the rear of the nacelle—as was done in the case of the Mosquito's nacelles.

An arrangement which satisfies A, B, C and D, and also incorporates some suggestions by other correspondents, would be something like this:—



I would very much like to settle the whole matter by meeting Mr. Pollitt over a pad of scrap-paper with a couple of pencils—but I hope that he can now understand more clearly what I had in mind. O. M. ETOE.



IN ITS ELEMENT : A rocket-firing Firefly returns to H.M.S. *Indefatigable* after attacking Japanese targets in Sumatra. Fireflies have recently done good work in attacks on oil refineries in Sumatra. (See pp. 182-183.)

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Promotions

GENERAL DUTIES BRANCH.

Air Comdre. G. HARCOURT-SMITH, C.B.E., M.V.O., is granted the act. rank of Air Vice-Marshal. Oct. 20th, 1944.

TECHNICAL BRANCH.

Air Comdre. G. COMBE is granted the rank of Air Vice-Marshal (temp.). Jan. 14th, 1945.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy :—

Bar to Distinguished Service Order

Act. Wing Cdr. G. D. SISE, D.S.O., D.F.C., R.N.Z.A.F., No. 248 Sqn.—This officer has displayed great gallantry in operations against the enemy. He is a brilliant leader whose personal example and untiring efforts have done much towards raising his squadron to the highest standard of fighting efficiency. Since being awarded a bar to the D.F.C. he has led formations of aircraft in several attacks on enemy shipping. In November, 1944, Wing Cdr. Sise participated in an attack on shipping in Floro Harbour. Much anti-aircraft fire was encountered. Wing Cdr. Sise's aircraft was hit. One engine caught fire, but he pressed home his attack and afterwards flew his damaged aircraft to base. Some days later this officer led a very large formation of aircraft in an operation off Aalsund. His great skill and forceful leadership played a large part in the success of the operation

Distinguished Service Order

Act. Wing Cdr. P. A. KLEBOE, D.F.C., A.F.C., R.A.F.V.R., No. 109 Sqn.—This officer continues to display the highest standard of skill and gallantry. He has completed a very large number of sorties, many of them against well-defended targets important to the enemy's war effort. In October, 1944, Wing Cdr. Kleboe took part in an attack on Essen. At the commencement of the bombing run heavy and concentrated anti-aircraft fire was encountered. The aircraft was hit. A large piece of shrapnel smashed through the pilot's windscreen. Wing Cdr. Kleboe sustained numerous small cuts about the face. This, together with the violent inrush of wind through the broken windscreen, temporarily blinded him. Control was lost. Wing Cdr. Kleboe quickly levelled out, however, and, although in great pain, went on to execute a steady and successful bombing run. He afterwards flew the aircraft safely back to this country. He set a fine example of tenacity and devotion to duty.

Act. Sqn. Ldr. R. FINDLATER, D.F.C., R.A.F., No. 109 Sqn.—This officer has displayed courage, tenacity and devotion to duty of a high order. He has completed a very large number of sorties, many of them being missions demanding the highest standard of ability. One night in November, 1944, he was the navigator of an aircraft detailed to attack Gelsenkirchen. His outstanding work in the difficult circumstances played a good part in the success of the sortie. In addition to his notable work in the air the officer has devoted much of his skill and knowledge towards the training of other members of the squadron. His record is most impressive.

Act. Sqn. Ldr. H. E. T. PRAGER, D.F.C., R.A.F.V.R., No. 514 Sqn.—This officer has completed very many sorties since being awarded the D.F.C. He has displayed outstanding qualities of leadership, great skill and unfailing devotion to duty. On one occasion in September, 1944, he took part in a bombing attack on Le Havre. In the run in the aircraft came under heavy anti-aircraft fire. The bomb bay was hit and set on fire. In spite of this, Sqn. Ldr. Prager held to a steady run to enable his bomb aimer to release his bombs on the target. Other members of the crew succeeded, with great difficulty, in extinguishing the flames, and Sqn. Ldr. Prager

Air Marshal Sir Ralph Cochrane, K.B.E., C.B., A.F.C., who has been appointed Air C.-in-C. of R.A.F. Transport Command.

SERVICE AVIATION

flew the aircraft safely to base. His coolness and resolution in dangerous circumstances were most commendable.

Flt. Lt. A. M. CROW, D.F.M., R.A.F.V.R., No. 544 Sqn.—This officer has a long and distinguished record of operational flying. His standard of work has always been high and he has set an inspiring example to all by his cheerfulness and intense keenness. As the senior navigator in his squadron, Flt. Lt. Crow has completed numerous operations with outstanding skill, courage and devotion to duty. On two occasions in 1944 this officer navigated his aircraft, at low level, against important enemy targets, and the successful completion of the missions was largely due to his skill and accuracy. On one occasion he spent many hours in a dinghy after his aircraft had been damaged by enemy action. Flt. Lt. Crow has continued to participate in operational flying with undiminished enthusiasm.

Act. Sqn. Ldr. J. A. REYNOLDS, D.F.C., R.C.A.F., No. 489 (R.N.Z.A.F.) Sqn.—Since the award of the D.F.C., Sqn. Ldr. Reynolds has taken part in numerous attacks against enemy shipping and shore positions in Norway and Holland. On many occasions he has led his squadron with such skill that, despite heavy opposition, much damage has been inflicted on the enemy. In May, 1944, this officer led a formation of aircraft in an attack on seven enemy merchant and 12 escort vessels off the Dutch coast. As the result of this operation three of the merchant ships were hit by torpedoes. All the escort vessels were attacked with fire from machine guns. In September, 1944, Sqn. Ldr. Reynolds participated in a low-level attack on Den Helder Harbour, and although his aircraft was damaged excellent results were achieved. Later, as deputy leader of combined wings, this officer took part in a daring attack against enemy shipping and shore batteries. He personally made a low-level attack on an anti-aircraft ship before attacking the shore positions. During the engagement the fin of his aircraft was almost completely shot away, making control an extremely difficult task; nevertheless Sqn. Ldr. Reynolds flew back to base where he made a perfect landing. He is an outstanding flight commander who has inspired the other members of his squadron by his courage and determination.

Wing Cdr. F. F. LAMBERT, D.F.C., R.A.F.O., No. 515 Sqn.—This officer has completed much operational flying and has displayed the highest standard of determination and devotion to duty throughout. His assignments have been many and varied, and the successes obtained are an excellent testimony to his great skill and fine fighting qualities. Wing Cdr. Lambert is an excellent squadron commander, whose gallant and skilful leadership has greatly inspired the formation he commands.

Act. Flt. Lt. R. E. KNIGHTS, D.F.C., R.A.F.V.R., No. 617 Sqn.—This officer has displayed the highest qualities of devotion to duty in operations against the enemy. Since being awarded the D.F.C., Flt. Lt. Knights has completed a large number of sorties, many of them against well defended and difficult targets. He has invariably pressed home his attacks with great determination and precision and his coolness and courage under enemy fire have been most inspiring. Flt. Lt. Knights took part in all three attacks on the German battleship *Tirpitz*. In the final operation, during which the vessel was sunk, this pilot pressed home his attack with great resolution. His was one of the several bombs which straddled the vessel.

Bar to Distinguished Flying Cross

Act. Wing Cdr. R. A. ATKINSON, D.S.O., D.F.C., R.A.F.O., No. 235 Sqn.—Since being awarded the D.S.O., Wing Cdr. Atkinson has participated in a very large number of sorties. In September, 1944, this officer led an attack on two merchant ships, both of which were sunk. In October, 1944, Wing Cdr. Atkinson led a formation of aircraft in an attack on a large barge, a tug and two escort vessels. In spite of intense anti-aircraft fire the attack was pressed home with great determination. The two escort vessels were set on fire and the tug seriously damaged. On yet another occasion this officer led a formation of aircraft in an attack on two small ships, both of which were sunk. By his gallant leadership and great tactical ability Wing Cdr. Atkinson played a prominent part in the successes obtained.

F/O. C. N. SAUNDERS, D.F.C., R.A.F.V.R.—As observer this officer has participated in a very large number of reconnaissances. Throughout he has displayed a high degree of skill and courage, and has never failed to secure excellent photographs, often in spite of considerable anti-aircraft fire. In October, 1944, he was detailed to observe the results of an attack on the sea wall at West Kapelle. In the first run over the target the aircraft was hit in the tail by a high explosive shell. In spite of this, and much concentrated light anti-aircraft fire, several good photographs were obtained. In November, 1944, F/O. Saunders again flew with great distinction on a similar mission over another enemy target. This officer has set a fine example to all.

Distinguished Flying Cross

Wing Cdr. J. K. F. MACDONALD, R.C.A.F., No. 432 (R.C.A.F.) Sqn.

F/O. D. M. COX, R.C.A.F., No. 433 (R.C.A.F.) Sqn.

Act. Sqn. Ldr. M. DODS, R.A.F.V.R., No. 514 Sqn.

Flt. Lt. S. BERRY, R.A.F.V.R., No. 622 Sqn.

Flt. Lt. M. H. M. MACLEAN, R.A.A.F., No. 608 Sqn.

Flt. Lt. C. W. STACEY, R.A.F., No. 90 Sqn.

Act. Flt. Lt. O. L. OBENDORFF, R.C.A.F., No. 433 (R.C.A.F.) Sqn.

F/O. J. W. ABELL, R.C.A.F., No. 431 (R.C.A.F.) Sqn.

F/O. J. L. KING, R.C.A.F., No. 424 (R.C.A.F.) Sqn.

F/O. A. I. ROWE, R.A.F.V.R., No. 115 Sqn.

F/O. E. M. LUKEY, R.N.Z.A.F., No. 149 Sqn.

F/O. L. A. SIMKISS, R.A.F.V.R., No. 571 Sqn.

Act. F/O. C. A. J. DIONNE, R.C.A.F., No. 425 (R.C.A.F.) Sqn.

Act. F/O. C. S. WALKER, R.C.A.F., No. 424 (R.C.A.F.) Sqn.

W/O. J. E. ROWLAND, R.A.F., No. 149 Sqn.

F/O. R. J. BRODIE, R.C.A.F., No. 426 (R.C.A.F.) Sqn.

Sqn. Ldr. J. E. DENNANT, R.A.F.O., No. 109 Sqn.

Sqn. Ldr. E. H. THOMPSON, A.R.A.F.O., No. 101 Sqn.

Act. Sqn. Ldr. C. F. G. GIBBONS, R.A.F.V.R., No. 109 Sqn.

Act. Sqn. Ldr. G. R. HAWES, R.A.F.V.R., No. 635 Sqn.

Act. Sqn. Ldr. W. JOHNSTON, R.A.F.V.R.

Act. Sqn. Ldr. L. N. ORCHARD, R.A.F.V.R.

Act. Sqn. Ldr. W. G. ROGERS, R.A.F.V.R., No. 97 Sqn.

Act. Sqn. Ldr. M. F. WHITE, R.A.F.V.R., No. 7 Sqn.

Flt. Lt. J. W. H. ALLEN, R.A.F.V.R., No. 635 Sqn.

Flt. Lt. C. BATTEN, R.A.F.V.R., No. 632 Sqn.

Flt. Lt. K. J. BETTLES, R.A.F.V.R., No. 214 Sqn.

Flt. Lt. R. H. Thomas, who has been awarded the M.B.E. for work in connection with motor transport.

Flt. Lt. G. E. BRADBURY, R.A.F.V.R., No. 692 Sqn.

Flt. Lt. H. E. BREWER, R.A.F.V.R., No. 635 Sqn.

Flt. Lt. P. F. G. GLOVER, R.A.F.V.R., No. 218 Sqn.

Flt. Lt. D. J. JOHNSTONE, R.A.F.V.R., No. 463 (R.A.A.F.) Sqn.

Flt. Lt. E. E. JONES, R.A.F.V.R., No. 78 Sqn.

Flt. Lt. H. G. MCLEOD, R.A.F., No. 50 Sqn.

Flt. Lt. R. W. C. MEADE, R.A.F.V.R., No. 78 Sqn.

Flt. Lt. B. F. MENAGE, R.A.F.V.R., No. 692 Sqn.

Flt. Lt. J. G. MESSENGER, R.A.F.V.R.

Flt. Lt. O. S. MILNE, R.A.F.V.R., No. 582 Sqn.

Flt. Lt. F. PARKER, R.A.F.V.R., No. 207 Sqn.

Flt. Lt. J. RITCHIE, R.A.F.V.R., No. 571 Sqn.

Flt. Lt. S. R. STANBRIDGE, R.A.F.V.R., No. 608 Sqn.

Flt. Lt. J. G. STRATFORD, R.A.F.V.R., No. 166 Sqn.

Act. Flt. Lt. L. J. ALDERMAN, R.A.F.V.R., No. 78 Sqn.

Act. Flt. Lt. R. S. BANNISTER, R.A.F.V.R., No. 582 Sqn.

Act. Flt. Lt. W. J. BASER, R.A.F.V.R., No. 7 Sqn.

Act. Flt. Lt. H. C. BEADLE, R.A.F., No. 77 Sqn.

Act. Flt. Lt. K. W. BIRT, R.A.F.V.R., No. 105 Sqn.

Act. Flt. Lt. G. BLAKE, R.A.F.V.R., No. 582 Sqn.

Act. Flt. Lt. R. G. BLAMIRES, R.A.F.V.R., No. 103 Sqn.

Act. Flt. Lt. H. W. BRITTON, R.A.F.V.R., No. 100 Sqn.

Act. Flt. Lt. S. CHILES, R.A.F.V.R., No. 428 (R.C.A.F.) Sqn.

Act. Flt. Lt. J. G. COOPER, R.A.F.V.R., No. 156 Sqn.

Act. Flt. Lt. D. R. COX, R.A.F.V.R., No. 15 Sqn.

Act. Flt. Lt. W. M. DOUGLAS, R.A.F.V.R., No. 635 Sqn.

Act. Flt. Lt. H. W. T. ENOCH, R.A.F.V.R., No. 50 Sqn.

Act. Flt. Lt. N. J. FRANKLIN, R.A.F.V.R., No. 582 Sqn.

Act. Flt. Lt. J. L. GILBERT, R.A.F.V.R., No. 214 Sqn.

Act. Flt. Lt. R. G. W. GROSS, R.A.F.V.R., No. 9 Sqn.

Act. Flt. Lt. W. H. HEANE, R.A.F.V.R., No. 582 Sqn.

Act. Flt. Lt. A. C. HICKS, R.A.F.V.R., No. 626 Sqn.

Act. Flt. Lt. N. P. HOLMES, R.A.F.V.R., No. 199 Sqn.

Act. Flt. Lt. F. R. LEATHERDALE, R.A.F.V.R., No. 7 Sqn.

Act. Flt. Lt. E. J. LONG, R.A.F.V.R., No. 156 Sqn.

Act. Flt. Lt. R. I. MANNING, R.A.F., No. 76 Sqn.

Act. Flt. Lt. T. J. A. MCCOMB, R.A.F.V.R., No. 582 Sqn.

Act. Flt. Lt. J. D. MELROSE, R.A.F., No. 9 Sqn.

Act. Flt. Lt. H. J. MORLEY, R.A.F.V.R., No. 635 Sqn.

Act. Flt. Lt. P. A. NETTLETON, R.A.F.V.R., No. 15 Sqn.

Act. Flt. Lt. H. B. PETTIFER, R.A.F.V.R., No. 51 Sqn.

Act. Flt. Lt. A. P. SADLER, R.A.F.V.R., No. 7 Sqn.

Act. Flt. Lt. S. D. SMART, R.A.F.V.R., No. 635 Sqn.

Act. Flt. Lt. E. SMETHURST, R.A.F.V.R., No. 635 Sqn.

Act. Flt. Lt. V. E. STUCHBERY, R.A.F.V.R., No. 105 Sqn.

Act. Flt. Lt. R. THOMAS, R.A.F.V.R., No. 550 Sqn.

Act. Flt. Lt. M. L. TOYNTON, R.A.F.V.R., No. 35 Sqn.

Act. Flt. Lt. J. A. TURK, R.A.F.V.R., No. 156 Sqn.

Act. Flt. Lt. S. TURNER, R.A.F., No. 35 Sqn.

Act. Flt. Lt. D. P. VARDON, R.A.F.V.R., No. 109 Sqn.

Act. Flt. Lt. J. F. S. WAINWRIGHT, R.A.F.V.R., No. 7 Sqn.

Act. Flt. Lt. E. WISEMAN, R.A.F.V.R., No. 199 Sqn.

F/O. W. L. ANDREWS, R.A.F.V.R., No. 218 Sqn.

F/O. E. R. BOWDEN, R.A.F.V.R., No. 578 Sqn.

F/O. M. T. CLARKE, R.A.F.V.R., No. 57 Sqn.

F/O. J. CUMMIN, R.A.F.V.R., No. 608 Sqn.

F/O. J. D. CROMBIE, R.A.F.V.R., No. 35 Sqn.

F/O. S. EVANS, R.A.F.V.R., No. 76 Sqn.

Wing Cdr. W. W. G. SCOTT, R.A.A.F., No. 608 Sqn.

Flt. Lt. D. F. MCLAUGHLAN, R.A.A.F., No. 467 (R.A.A.F.) Sqn.

Flt. Lt. B. L. THOMSON, R.A.A.F., No. 166 Sqn.

Act. Flt. Lt. F. M. BARKLA, R.A.A.F., No. 462 (R.A.A.F.) Sqn.

Act. Flt. Lt. A. R. CHRISTIAN, R.A.A.F., No. 158 Sqn.

Act. Flt. Lt. J. R. CORAM, R.A.A.F., No. 218 Sqn.

Act. Flt. Lt. W. T. EDDY, R.A.A.F., No. 7 Sqn.

Act. Flt. Lt. R. R. WITHAM, R.A.A.F., No. 138 Sqn.

F/O. A. H. C. ATKINS, R.A.A.F., No. 625 Sqn.

F/O. V. A. BAGGOTT, R.A.A.F., No. 467 (R.A.A.F.) Sqn.

F/O. P. BARSON, R.A.A.F., No. 199 Sqn.

F/O. R. J. BUDDEN, R.A.A.F., No. 80 Sqn.

F/O. G. G. FLACK, R.A.A.F., No. 51 Sqn.

F/O. J. W. MOORE, R.A.A.F., No. 9 Sqn.

F/O. A. B. NEILSON, R.A.A.F., No. 619 Sqn.

Flt. Lt. J. W. KERR, R.C.A.F.

Flt. Lt. D. R. MACLEOD, R.C.A.F., No. 429 (R.C.A.F.) Sqn.

Flt. Lt. D. W. MADDOCKS, R.C.A.F., No. 140 Sqn.

Flt. Lt. J. D. MITCHELL, R.C.A.F., No. 627 Sqn.

Flt. Lt. A. E. PATTERSON, R.C.A.F., No. 429 (R.C.A.F.) Sqn.

Flt. Lt. J. T. SHERIDAN, R.C.A.F., No. 426 (R.C.A.F.) Sqn.

Flt. Lt. H. SPECTOR, R.C.A.F., No. 571 Sqn.

Flt. Lt. F. S. STEELE, R.C.A.F., No. 550 Sqn.

Flt. Lt. D. R. TAYLOR, R.C.A.F., No. 419 (R.C.A.F.) Sqn.

Flt. Lt. H. R. WHITTALL, R.C.A.F., No. 405 (R.C.A.F.) Sqn.

Act. Flt. Lt. C. A. APPLETON, R.C.A.F., No 433 (R.C.A.F.) Sqn.

Act. Flt. Lt. E. ATKINS, R.C.A.F., No. 415 (R.C.A.F.) Sqn.

Act. Flt. Lt. D. J. L. HILL, R.C.A.F., No. 115 Sqn.

Act. Flt. Lt. D. S. MCKECHNIE, R.C.A.F., No. 7 Sqn.

Act. Flt. Lt. K. C. PASSMORE, R.C.A.F., No. 192 Sqn.

Act. Flt. Lt. A. R. SMYTH, R.C.A.F., No. 149 Sqn.

Act. Flt. Lt. M. STEELE, R.C.A.F., No. 428 (R.C.A.F.) Sqn.

Act. Flt. Lt. W. V. TOBIAS, R.C.A.F., No. 432 (R.C.A.F.) Sqn.

Act. Flt. L. G. O. WARD, R.C.A.F., No. 192 Sqn.

F/O. A. G. ANGUS, R.C.A.F., No. 419 (R.C.A.F.) Sqn.

F/O. J. S. BEARD, R.C.A.F., No. 57 Sqn.

F/O. W. H. C. BOYD, R.C.A.F., No. 415 (R.C.A.F.) Sqn.

F/O. J. G. BREWSTER, R.C.A.F., No. 435 (R.C.A.F.) Sqn.

F/O. W. BRIGHT, R.C.A.F., No. 12 Sqn.

F/O. M. A. BUCHANAN, R.C.A.F., No. 550 Sqn.

F/O. E. H. CAWSEY, R.C.A.F., No. 7 Sqn.

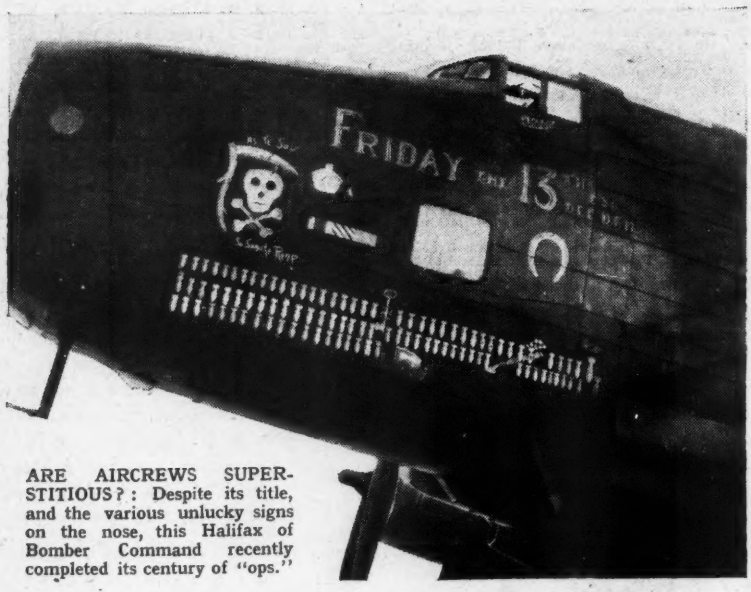
F/O. J. H. H. CHARLEBOYS, R.C.A.F., No. 433 (R.C.A.F.) Sqn.

F/O. C. D. CHRISTIAN, R.C.A.F., No. 419 (R.C.A.F.) Sqn.

F/O. R. O. DE NEVERS, R.C.A.F., No. 192 Sqn.

F/O. R. C. DIAMOND, R.C.A.F., No. 432 (R.C.A.F.) Sqn.

F/O. M. R. DOBSON, R.C.A.F., No. 433 (R.C.A.F.) Sqn.



ARE AIRCREWS SUPERSTITIOUS?: Despite its title, and the various unlucky signs on the nose, this Halifax of Bomber Command recently completed its century of "ops."

F/O. D. J. DICKIE, R.N.Z.A.F., No. 166 Sqn.
F/O. R. C. JOHNSON, R.N.Z.A.F., No. 7 Sqn.
F/O. D. W. LEE, R.N.Z.A.F., No. 100 Sqn.

Distinguished Flying Medal

Flt. Sgt. C. W. ADAMS, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. R. E. ADAMS, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. K. G. ALLUM, R.A.F.V.R., No. 12 Sqn.
Flt. Sgt. A. W. BIRSE, R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. J. N. CASTLE, R.A.F.V.R., No. 101 Sqn.
Flt. Sgt. R. H. CHAPMAN, R.A.F.V.R., No. 635 Sqn.
Flt. Sgt. G. K. L. CLARK, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Flt. Sgt. R. COMMONS, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. (now P/O.) W. J. CONOLLY, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. J. J. CORKERY, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. (now P/O.) B. A. CRISP, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
Flt. Sgt. G. DYSON, R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. J. H. D. EBANKS, R.A.F.V.R., No. 571 Sqn.
Flt. Sgt. (now W/O.) J. B. ELDER, R.A.F., No. 156 Sqn.
Flt. Sgt. A. A. FARR, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
Flt. Sgt. J. B. FLETCHER, R.A.F.V.R., No. 635 Sqn.
Flt. Sgt. G. R. GREEN, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. (now W/O.) P. GOUGH, R.A.F., No. 35 Sqn.
Flt. Sgt. V. H. HAYWARD, R.A.F., No. 51 Sqn.
Flt. Sgt. H. HODGES, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. L. A. W. HOWES, R.A.F.V.R., No. 635 Sqn.
Flt. Sgt. J. R. HUGHES, R.A.F.V.R., No. 582 Sqn.
Flt. Sgt. D. KNAPPER, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. (now W/O.) G. W. A. LLOYD, R.A.F., No. 35 Sqn.
Flt. Sgt. J. McL. MALCOLM, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. P. J. MCMONAGLE, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
Flt. Sgt. L. J. S. O'HANLON, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
Flt. Sgt. D. H. OWEN, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. J. A. H. ASHCROFT, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
Flt. Sgt. J. O. Y. BERGERON, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
Flt. Sgt. S. C. CASSELS, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
Flt. Sgt. (now P/O.) L. E. MCLEAN, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
Flt. Sgt. (now P/O.) A. H. MORRISON, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
Sgt. T. W. CHRISTIE, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
Flt. Sgt. G. F. FELSTEAD, R.A.F.V.R., No. 7 Sqn.
Sgt. C. E. SEARLE, R.A.F.V.R., No. 115 Sqn.

Army Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in North West Europe:—

Third Bar to Distinguished Service Order

Maj. (temp. Lt.-Col.) A. S. PEARSON, D.S.O., M.C., Army Air Corps.

O.B.E. (Mil.)

W/O. II (Reg. Q.M.S.) G. A. FOX, Army Air Corps.

Bar to Military Cross

Lt. (temp. Capt.) M. J. D'A. BLACKMAN, M.C., The Sherwood Foresters (attd. Army Air Corps).

Distinguished Flying Cross

Lt. (temp. Capt.) A. J. NICHOLSON, Royal Regiment of Artillery.
Lt. (temp. Capt.) R. VIPOND, Royal Regiment of Artillery.

Distinguished Conduct Medal

Pte. S. CORNELL, Army Air Corps.

Military Medal

Sgt. J. A. HOLMES, Army Air Corps.

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services:—

Distinguished Flying Cross

Lt. (temp. Capt.) C. M. BELL, Royal Regiment of Artillery.

Distinguished Flying Medal

L/Bombardier J. D. GIBBS, Royal Regiment of Artillery.

Roll of Honour

Casualty Communiqué No. 469.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 81 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. F. Buchan; Flt. Sgt. J. S. Burnham; F/O. J. S. Crank; Flt. Lt. O. P. Faraday; F/O. L. M. Gray; F/O. P. S. Griffiths; Flt. Sgt. D. W. Jolliffe; F/O. J. M. Killner; Flt. Lt. K. J. Merritt; Flt. Sgt. G. S. Sharpe, D.F.M.; Sgt. E. Smith; Sgt. J. Strowger; P/O. F. A. Wilks.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. W. J. Bellinger; Sgt. D. F. Butler; F/O. H. Clark; Sgt. D. F. Faulkener; Flt. Sgt. J. A. T. Griffith; P/O. J. W. Hinde; Sgt. J. L. Howell; P/O. M. S. Lynch; Flt. Sgt. N. F. Miles; Sgt. A. W. Watson; Sgt. D. G. Whittaker; Sgt. G. W. Yates.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. R. Barbour; P/O. R. A. Bayldon; Sgt. W. H. Blake; Sgt. W. R. Boucher; Sgt. F. L. Bousher; Sgt. G. Chapman; Flt. Sgt. W. E. Coates; Flt. Sgt. R. J. Collens; Sgt. F. S. Cope; Sgt. D. Corbitt; F/O. H. A. De Vries; Sgt. A. E. H. Edwards, Sgt. E. Egan; Sgt. J. Falconer; Sgt. P. H. Fryer; Sgt. A. F. Gleadle; Sgt. P. G. Hancock; P/O. K. N. Hicklin, D.F.M.; P/O. J. Howe; Sgt. R. R. Jones; Sgt. W. B. Jones; Flt. Sgt. J. H. Jowett; Sgt. G. Kemp; Flt. Sgt. W. N. Kinsey; Sgt. D. S. Loveland; Sgt. E. Lunniss; Sgt. A. L. McConnell; P/O. S. Mayer, C.G.M.; Sgt. J. F. Morgan; Sgt. F. Moss; F/O. B. Otter; F/O. D. E. Reay; Flt. Sgt. J. C. E. Rees; Sgt. A. Richardson; Sgt. R. W. Roberts; Sgt. J. K. Robertson; W/O. J. H. Saxton; Act. Flt. Lt. K. M. Steven; F/O. J. Storey; Sgt. C. Watson; Sgt. J. K. Widdop; Sgt. A. Wiggins; Sgt. G. W. Woolley; Sgt. F. E. Woolven.

WOUNDED OR INJURED IN ACTION.—Sgt. E. G. J. Collins; Flt. Sgt. R. R. Smith.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. R. T. Jackson.

MISSING.—F/O. G. J. Allin; Sgt. J. B. Anderton; W/O. E. R. Andrews; Sgt. R. P. Barton; P/O. F. W. Batterbury; Sgt. P. E. Bennett; Flt. Lt. B. G. Bensted; W/O. J. H. Bradburn; W/O. K. R. Brant; Flt. Sgt. R. C. Bray; Sgt. K. Buckley; P/O. C. L. Burrage; Sgt. N. Cardwell; Flt. Sgt. N. G. G. Carn; Flt. Sgt. C. R. Clement; Sgt. W. D. Craill; Act. F/O. C. W. Crawford; Sgt. D. Crerar; Flt. Sgt. G. Cross; Sgt. R. M. Davies; Sgt. J. Divens; Sgt. A. G. Dollery; Sgt. W. R. Dryburgh; Flt. Sgt. J. A. Fell; Sgt. E. Finney; Flt. Lt. W. Goddard; Sgt. G. S. Grogan; Act. F/O. K. Harrop; Flt. Lt. P. Hetherwick; Sgt. R. Heugh; Sgt. S. Hodgkinson; Sgt. P. Hogan; Flt. Sgt. R. J. Holland; F/O. N. H. Hornby; Flt. Sgt. W. R. S. Hurrell; Flt. Sgt. G. R. Irving; W/O. I. L. Irving; Sgt. G. Kernohan; Act. F/O. T. E. Kerslake; Sgt. L. Kilvington; Flt. Sgt. G. B. Kirby; F/O. C. E. Laishley; F/O. E. H. Lomas; Sgt. P. C. Lowe; Sgt. J. S. McClenahan; Flt. Sgt. A. M. B. McDonald; Sgt. R. McKeen; Sgt. J. G. McKenzie; Sgt. D. Menzies; Sgt. A. Moir; W/O. J. R. Muller; Flt. Sgt. A. S. Nairn; Sgt. D. Parker; Sgt. R. J. Parsons; Sgt. R. J. Paul; Sgt. K. G. Prichard; Flt. Sgt. J. S. Ratcliffe; F/O. S. W. Reeder; Sgt. T. Rees; Sgt. A. Reilly; Sgt. A. Richardson; Sgt. H. E. Smith; Flt. Lt. D. Stewart; F/O. C. G. Tapson; Flt. Lt. R. H. Thomas; Sgt. A. C. L. Todd; Flt. Lt. S. A. Waddington; Sgt. L. T. Webster; Sgt. R. C. West; Flt. Lt. R. U. Williams; Flt. Sgt. C. Wilshaw; P/O. J. L. Wilson; Sgt. E. G. Woodward.

KILLED ON ACTIVE SERVICE.—Sgt. H. Allport; Flt. Sgt. R. V. Askey; L.A/C. A. R. Austrin; Flt. Sgt. K. M. Bardell; Flt. Sgt. R. F. Beasty; Sgt. R. Beynon; Act. Wing Cdr. J. L. Brown; Sqn. Ldr. G. A. G. Campbell; Flt. Lt. R. R. Clark; Sgt. G. H. C. Conisbee; Sgt. L. W. P. Cooke; F/O. G. Cummings, D.F.M.; L.A/C. S. K. Dawson; Sgt. R. A. Dowling; Sgt. R. A. Ellis; F/O. R. S. Euler; Sgt. I. D. W. Fletcher; Sgt. E. F. Gazley; Sgt. K. L. Hilton; Sgt. C. J. J. Hunter; Act. Wing Cdr. M. A. Johnson, D.F.C.; F/O. A. G. Jones; Flt. Sgt. C. J. Jones; Flt. Sgt. F. W. Jordan; Flt. Lt. E. R. Lewendon; L.A/C. J. T. McHugh; Sgt. G. Moreman; Cpl. E. C. Morris; Sgt. J. E. Peck; L.A/C. A. E. Quick; Sgt. F. J. W. Rawlings; Flt. Sgt. L. H. Smit; Flt. Sgt. L. J. Stott; F/O. C. J. Walters; Flt. Sgt. A. S. Warham; Sgt. C. W. West; Sgt. E. L. Wilson; Sgt. R. A. Wright.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. H. C. Adams; L.A/C. C. F. Ashby; Sgt. R. Atkins; Flt. Sgt. R. J. Banks; L.A/C. W. W. Hutchings; W/O. G. Milner.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—L.A/C. N. Kenworthy; A/C.1 C. C. Martin; L.A/C. W. L. Matthews.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 S. Hart; Sgt. D. A. Jefferson; L.A/C. F. N. Moores; L.A/C. J. Shaw; Act. Sqn. Ldr. E. J. C. Smither; L.A/C. E. A. West.

DIED ON ACTIVE SERVICE.—L.A/C. C. L. B. Brough; L.A/C. L. C. Burkes; A/C.2 R. W. Churchill; Cpl. H. V. Eastham; A/C.1 A. K. Green; L.A/C. H. H. Hallums; Sgt. P. E. Healey; Cpl. H. McNeil; Cpl. R. N. Meldrum; A/C.1 H. Metcalfe; L.A/C. P. Murphy; Flt. Lt. R. A. Noble; Sgt. F. Triplett; W/O. W. Williams; A/C.2 R. P. J. Yeomans.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. J. Burns; F/O. J. C. McCall; W/O. C. Woodington.

The crest of No. 184 Sqn., "Nihil Impenetrabile," (Nothing Impenetrable).

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—Flt. Sgt. E. Barker; L.A/CW. M. E. English; L.A/CW. D. Fearon; Cpl. B. White.

Royal Australian Air Force

KILLED IN ACTION.—W/O. L. J. Firth; F/O. K. Frost; P/O. F. B. Knight; F/O. R. H. Lopez; Flt. Sgt. W. B. Wheeler.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. F. S. G. Chidgey; F/O. A. J. D. Leslie; Flt. Sgt. J. K. Thompson.

MISSING.—Flt. Lt. J. C. Barlow; Sgt. R. J.

AVIATION

Bolton; Flt. Sgt. J. R. Charley; Flt. Sgt. A. C. Davidson; P/O. C. J. Girling; F/O. C. D. Hamilton; Flt. Sgt. W. J. Marris.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. H. J. Maddalena; Flt. Sgt. D. V. White.

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. A. G. Gibbons.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. H. E. Dawson; P/O. J. F. Howell-Price; F/O. H. J. Shipley.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Lt. I. MacK. Duff; F/O. I. H. MacLean; F/O. W. G. Peacock; F/O. W. Walker.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. J. D. McGowan; P/O. J. A. P. E. Roy.

MISSING, BELIEVED KILLED IN ACTION.—F/O. R. A. Johns; Flt. Lt. A. B. Newsome; Sqn. Ldr. W. H. Pentland, D.F.C.; F/O. H. F. Wakeman.

MISSING.—Flt. Sgt. G. P. Adams; F/O. R. W. Akey; P/O. J. Blair; Flt. Sgt. E. Borkowsky; P/O. G. W. Brooks; Sgt. R. A. Campbell; P/O. A. I. Cohen; Flt. Sgt. K. J. Edmison; Flt. Sgt. R. F. Emerson; P/O. F. J. A. Frey; Flt. Sgt. M. Gnida; P/O. J. H. E. Goldfinch; W/O. R. J. Gregory; F/O. J. A. G. Julien; P/O. L. R. Kay; Sgt. H. R. Latham; Sgt. A. E. McGraw; F/O. D. S. MacGregor; F/O. T. N. McNulty; F/O. J. G. MacPhee; P/O. W. A. MacWilliam; Flt. Sgt. T. G. Morin; F/O. G. W. Murphy; Flt. Sgt. L. F. O'Hara; Wing Cdr. C. W. Palmer, D.F.C.; F/O. R. W. Pettigrew; P/O. W. M. Ritchie; P/O. E. A. Russell; P/O. R. D. Scott; P/O. C. Service; P/O. W. S. Shoemaker; P/O. J. T. Short; P/O. J. E. Tazuk; F/O. J. W. Thompson; F/O. B. J. M. Thorp; P/O. A. Le R. Wall.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. S. Lievense.

KILLED ON ACTIVE SERVICE.—Flt. Lt. L. I. Armstrong; F/O. L. E. Cameron; P/O. J. P. Farrell; Sgt. C. B. Greer; L.A/C. J. J. G. Marcoux.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. R. D. Christie; F/O. R. F. J. MacDonald; Cpl. A. H. Negus.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—W/O. A. A. Cameron.

Royal New Zealand Air Force

WOUNDED OR INJURED IN ACTION.—W/O. D. McK. Tunnicliffe.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. L. A. Townrow.

MISSING, BELIEVED KILLED IN ACTION.—F/O. J. D. A. Beal; F/O. K. Southward.

MISSING.—Flt. Sgt. T. S. Edwards.

KILLED ON ACTIVE SERVICE.—W/O. C. M. Blue.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. E. H. Behrent; Flt. Sgt. N. Breward.

DIED ON ACTIVE SERVICE.—W/O. E. L. Darrell.

South African Air Force

KILLED IN ACTION.—2/Lt. D. P. Farrel.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Lt. P. G. F. Bailey; Lt. L. J. Oates.

MISSING, BELIEVED KILLED IN ACTION.—Lt. G. A. Roy.

MISSING.—Air Mech. A. R. P. Brehem; Air Mech. E. H. Cramer; Act. Cpl. J. F. Myburgh; Air Mech. D. O. R. Mullen; Lt. D. L. Robinson; Air Mech. J. Sloane.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Lt. L. G. E. F. Cash.

DIED ON ACTIVE SERVICE.—Act. Cpl. G. L. Duncan.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Lt. W. Birch.

Casualty Communiqué No. 470

Of the names in this list, 43 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. J. R. B. Airlie; Sgt. W. N. Anfield; Sgt. D. J. Ansell; Flt. Lt. A. E. Ashcroft, D.F.C.; F/O. L. A. Barham; Sgt. G. W. Bradshaw; Flt. Sgt. W. L. P. Cairns; P/O. F. R. Chatwin; P/O. K. E. Clark; Flt. Sgt. P. G. Griffits; F/O. A. W. Grime; P/O. S. Harrison; F/O. J. W. Hartley; Sgt. J. L. Higgison; Sgt. C. R. Knight; Sgt. A. W. Loveland; Sgt. J. W. Naylor; Sgt. J. S. Paterson; Sgt. B. Reilly; P/O. K. L. Rendell; Sgt. P. O. Roberts; Sgt. E. F. Rogers; Sgt. R. C. Saddler; Sgt. W. G. D. Shearer; Flt. Lt. P. B. Smith; Sgt. E. Stockford; P/O. G. Valentine; Sgt. W. T. White; Sgt. J. Whiteley; Sgt. J. McDowall.

The Crest of No. 98 Sqn., "Never Failing."

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. E. A. Carter; Sgt. F. E. W. Chapman; F/O. R. H. Cond; Sgt. J. P. King; F/O. R. Mackay; F/O. R. G. MacLeod; Sgt. P. McQueeney; Flt. Sgt. H. Morral; Sgt. V. N. Traylor.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. W. T. Anderson; P/O. W. Anderson; Sgt. E. Atkinson; Flt. Sgt. G. A. Atkinson; Flt. Sgt. L. W. Ball; Sgt. E. Berry; Flt. Sgt. J. T. S. Boddington; Flt. Sgt. G. W. Box; Flt. Sgt. D. F. Brown; Sgt. R. A. Campbell; Sgt. H. A. Clark; Sgt. A. Cohen; Flt. Sgt. A. W. Coote; Sgt. T. S. R. Dagnall; Sgt. J. B. Daniel; Sgt. D. D. Dempster; Sgt. D. A. Dixon; Sgt. D. S. Fawcett; F/O. V. S. Flack; Sgt. J. S. Fraser; P/O. C. Fuller; Sgt. M. German; Sgt. J. B. Gooravitch; Sgt. J. T. Hadland; Sgt. S. Henderson; Sgt. J. W. Hennis; Sgt. D. L. Hollamby; Act. Flt. Lt. F. T. Hopps, D.F.C.; P/O. L. Howard; Sgt. E. R. Hughes; Flt. Sgt. H. P. Hurnell; Sgt. R. S. Imeson; Sgt. G. Kensall; Sgt. W. R. Knight; Flt. Lt. A. G. McAdam, A.F.C.; Sgt. V. W. McGray; Sgt. D. G. Mann; Flt. Sgt. A. E. Millard, D.F.M.; Sgt. R. Mosley; Sgt. J. K. Mosman; Sgt. A. E. Nattrass; P/O. K. D. Pearce; Sgt. R. Phippe; Sgt. W. Phipps; Flt. Sgt. C. F. Plumb; F/O. B. N. J. Price; F/O. K. P. Rand; Sgt. F. D. Robbins; Sgt. J. Roberts; Sgt. W. L. Sargent; Sgt. D. H. Shaw; Sgt. R. G. B. Shea; P/O. H. H. Sherer; Sgt. J. P. Slater; Sgt. S. F. Smith; Sgt. T. J. Smith; Sgt. J. Southwell; Flt. Sgt. R. Stevenson; Sgt. R. Thomas; Act. Flt. Sgt. A. J. Thomson; Sgt. T. Thomson; Sgt. P. V. de V. Vickers; Sgt. T. Wainwright; Sgt. J. Wannop; Sgt. J. Waters; Flt. Sgt. F. T. West; Sgt. J. J. Whelan; F/O. T. I. Widdowson; Sgt. L. J. Wilson.

WOUNDED OR INJURED IN ACTION.—Act. Sqn. Ldr. Greenleaf; Flt. Sgt. G. E. Thompson.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. D. Chalmers, D.F.M.; Flt. Sgt. J. E. Cowan, D.F.M.; Flt. Lt. F. H. Foden; F/O. P. S. Haw; F/O. A. C. Porter; Flt. Sgt. W. H. Skewes.

MISSING.—Flt. Sgt. D. J. Allaway; W/O. W. D. B. Allen; Sgt. G. W. Bargh; Sgt. B. G. Barker; W/O. L. J. Billen; Sgt. A. J. Birrell; Act. Flt. Lt. T. W. Black, D.F.C.; Sgt. A. W. Blake; W/O. A. W. Blaxall; Flt. Sgt. M. W. Blockley; Sgt. J. Boutle; Sgt. W. W. Bowden; Flt. Lt. J. E. Brook; F/O. G. W. Broughton; Sgt. G. S. Cheesbrough; Sgt. G. G. Clark; Sgt. C. A. Coe; Flt. Sgt. R. Cowan; Sgt. F. S. Crowther; Sgt. C. B. Davidson; W/O. A. E. England; Sgt. R. E. Faulkner; Flt. Sgt. W. P. Foster; P/O. T. H. Gibson; Flt. Sgt. D. H. Grant; Flt. Sgt. C. R. J. Green; Sgt. G. W. Habgood; Flt. Sgt. L. H. Harwood; P/O. H. A. Heap; Flt. Sgt. K. M. Henderson; Sgt. E. W. Heywood; Act. Sqn. Ldr. R. M. Higgs, D.F.C.; Act. Sqn. Ldr. J. E. S. Hill; Sgt. A. Horridge; F/O. R. Jarrett; Sgt. W. N. Jenkins; Sgt. J. Johnston; F/O. L. T. Jordan; Sgt. G. E. Kemp; W/O. R. T. Knight; Flt. Lt. R. Korer; Sgt. L. M. Langley; Sgt. F. Laws; W/O. W. J. Lilly; Sgt. H. Lockett; Flt. Sgt. J. A. McKillop; Sgt. J. P. W. McLellan; Flt. Sgt. L. Marsh; P/O. A. Mason; P/O. P. D. Metcalfe; P/O. E. C. Mitchell; F/O. W. Morris; Sgt. A. Moss; Flt. Sgt. J. H. Oblein; Flt. Sgt. R. G. Phillips; Flt. Lt. G. H. Proctor; P/O. A. Rockcliffe; P/O. J. A. Rogers; F/O. A. Shippin; F/O. M. S. C. Smith; F/O. W. I. D. Smith; Act. F/O. R. L. Stanley; Flt. Sgt. W. M. Thomas; Sgt. G. H. Tilburn; P/O. L. A. Veary; F/O. J. W. Warrington; Flt. Sgt. J. M. A. Watson; Sgt. C. F. Whitefield; Sgt. A. Whitworth; F/O. N. Wilkinson; Sgt. L. P. Willetts; F/O. V. G. Williams, D.F.C.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. H. G. Cawfield; Sgt. C. W. Mathews.

KILLED ON ACTIVE SERVICE.—L.A/C. W. A. G. Alston; Sgt. D. F. Banfield; Sgt. G. P. Barber; Sgt. L. A. Bassman; F/O. G. J. Burch; Sgt. K. Clayton; Sgt. S. F. Coleman; Sgt. A. T. Collins; Sgt. J. E. Conchie; F/O. W. J. E. Dennis; F/O. J. Else; Sgt. D. C. Evans; P/O. P. Fox; Sgt. S. A. Gault; Sgt. C. R. Gollop; Sgt. N. Graham; W/O. W. C. Hall; Sgt. C. Harper; L.A/C. A. D. Harvey; F/O. F. D. Hill; Sgt. C. S. Howard; Sgt. T. W. Jones; F/O. J. D. Lambert; Sgt. T. W. Lightley; Flt. Sgt. D. C. McLackland; Sgt. J. McVey; Sgt. N. E. Mead; Sgt. A. J. Pearce; W/O. J. E. Restell; Sgt. O. J. Rowlands; Sgt. F. C. Saunders; Sgt. J. P. Sheridan; Flt. Sgt. D. L. T. Smith; F/O. E. A. Smith; Flt. Lt. G. E. T. Soden; Flt. Sgt. L. M. Stockwell; F/O. T. Y. Thomas; Sgt. J. L. Toplis; P/O. J. R. Townley; Flt. Sgt. E. W. Tranmer; Sgt. R. A. Wilkinson; Sgt. A. H. Wilton; Sgt. L. Wright; Sgt. M. Woodhead.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. C. F. Craig; Sgt. W. Swire.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. L. S. Baker; Flt. Sgt. H. W. Barnes; L.A/C. W. Cox; L.A/C. G. M. S. Elsworth; A/C.1 W. J. Giles; F/O. S. W. R. Harris; F/O. D. W. Lloyd, D.F.M.; Cpl. C. J. Payne; Cpl. G. P. Walker; L.A/C. A. Watt.

DIED ON ACTIVE SERVICE.—L.A/C. D. Beaumont; A/C.1 G. Booth; Sgt. A. R. Bundock; Cpl. E. Burnett; Flt. Lt. A. J. Chiappa-Sinclair; F/O. S. V. Duddles; Sgt. W. Gordon; A/C.2 A. Grayson; Sgt. J. L. R. Green; L.A/C. A. R. Hicks; Sgt. R. J. Hurst; Cpl. H. Sharples; W/O. J. I. Williams.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. D. Allatt; Flt. Sgt. P. Latchford; Flt. Lt. R. F. Prior; Sgt. P. D. Ruiz-de-Velasco; F/O. D. H. Storer; Flt. Lt. M. B. Strubell.

Women's Auxiliary Air Force

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. W. J. E. Lindsay; W/O. A. E. Binks; Cpl. E. P. Norman; L.A/CW. G. Coakley; A/CW.1 N. Bowles; L.A/CW. K. L. McKinlay.

DIED ON ACTIVE SERVICE.—Sgt. J. G. Beggs.

Royal Australian Air Force

KILLED IN ACTION.—P/O. B. F. Lee; P/O. W. S. Vale.

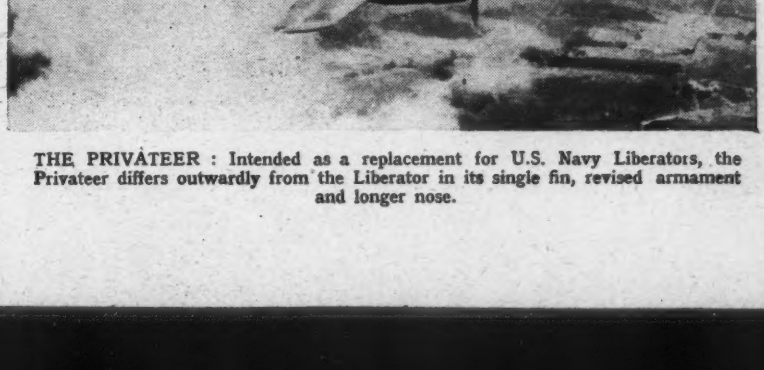
PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. T. L. Griffiths.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. M. J. Banks; P/O. G. Bushell; W/O. C. W. Crawley; Flt. Sgt. L. J. McCarthy; Flt. Sgt. R. S. Nelson; Flt. Sgt. G. S. Read; Flt. Sgt. R. C. Reed.

MISSING, BELIEVED KILLED IN ACTION.—F/O. T. J. Bolger.

MISSING.—Sgt. G. Beckoff; Flt. Sgt. R. C. Broad; Flt. Sgt. G. F. Geraghty; Flt. Sgt. F. M. Herne; Act. F/O. R. A. Jones; F/O. T. J. Kenyon; Flt. Sgt. R. C. Klezel; P/O. P. R. Lord; Flt. Sgt. T. A. McManus; Flt. Sgt. J. S. MacPherson; Flt. Sgt. N. F. Robinson; Flt. Sgt. L. K. Robson; F/O. F. C. Sanders; Flt. Sgt. F. S. B. Scougall; Flt. Sgt. A. J. Smith; Act. F/O. D. G. Tointon; Flt. Sgt. B. de B. White; P/O. A. S. Williams.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. A. J. Cantwell; Flt. Sgt. P. S. Coronel; Flt. Sgt. C. J. Mitchell; Flt. Sgt. J. N. Smith.



THE PRIVATEER : Intended as a replacement for U.S. Navy Liberators, the Privateer differs outwardly from the Liberator in its single fin, revised armament and longer nose.

SERVICE AVIATION

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. D. L. Farndell.

DIED ON ACTIVE SERVICE.—F/O. H. G. Ainslie

Royal Canadian Air Force

KILLED IN ACTION.—F/O. D. L. Jack; Flt. Sgt. D. J. O'Sullivan.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—W/O. W. H. Ferris.

WOUNDED OR INJURED IN ACTION.—Sgt. R. W. McClean; Flt. Sgt. J. R. Morse; Flt. Sgt. D. S. Snell; P/O. G. H. Tole.

MISSING, BELIEVED KILLED IN ACTION.—F/O. H. H. King.

MISSING.—Cpl. J. E. Allen; L.A/C. L. I. Beach; L.A/C. O. E. D. Bergen; L.A/C. R. T. Burden; Cpl. W. H. Campbell; L.A/C. J. A. R. Chevrier; L.A/C. J. R. M. A. Couturier; F/O. I. T. Cromb; Cpl. J. Cumming; Sgt. E. L. Dunn; L.A/C. F. R. Gates; L.A/C. M. J. F. Good; Sgt. W. F. Hughes; Cpl. H. J. Hunter; Sgt. J. W. Irwin; P/O. E. J. Kennedy; L.A/C. F. L. Kristensen; L.A/C. W. J. S. Lundy; P/O. R. McCloy; L.A/C. D. J. MacDonald; A/C.1 J. D. McVie; F/O. H. J. Muir; Flt. Lt. J. R. Murray; F/O. W. R. Paget; W/O. R. I. Pinner; P/O. G. E. Pratt; F/O. R. H. Ridgway; Cpl. F. W. Sargeant; Sgt. B. A. Skebo; P/O. G. A. Slater; P/O. F. A. Steele; L.A/C. A. C. Sutherland; L.A/C. H. S. Watson; Cpl. L. H. Moreau.

KILLED ON ACTIVE SERVICE.—Wing Cdr. M. W. Beveridge, D.F.C.; Flt. Lt. F. G. Johnson; Sgt. J. D. Shykoff.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. L. R. C. Champagne.

DIED ON ACTIVE SERVICE.—Cpl. C. C. Anderson.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Lt. G. L. Bonham, D.F.C.; W/O. I. W. Cain; Flt. Sgt. C. S. Henderson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. D. W. Metherell.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. S. Gallagher; Flt. Sgt. L. Kell; Flt. Sgt. P. E. Mason.

MISSING, BELIEVED KILLED IN ACTION.—F/O. L. J. Brennan; F/O. R. J. Cammock; Flt. Lt. A. E. Dryden.

MISSING.—Flt. Sgt. R. W. Cuthbert; W/O. G. J. Roney.

KILLED ON ACTIVE SERVICE.—F/O. R. R. Bradshaw; Act. F/O. W. L. Shirley.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. B. N. Petersen.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—W/O. G. A. Davies.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Act. Flt. Lt. C. S. Gay.

South African Air Force

WOUNDED OR INJURED IN ACTION.—Lt. R. H. Cullingham; Maj. P. W. Venter.

MISSING, BELIEVED KILLED IN ACTION.—Lt. T. J. C. Hopkins.

MISSING.—Capt. C. H. Campbell; 2/Lt. B. W. G. Garrick.

Casualty Communiqué No. 471.

Of the names in this list 99 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—W/O. S. Barnes; F/O. R. B. Burrows; Sgt. J. D. Crabtree; Flt. Lt. J. Farrally; Flt. Sgt. J. C. H. Hackett; Sgt. G. A. Harris; W/O. J. J. Hyde; Sgt. H. W. Jennings; Act. Sqn. Ldr. C. D. N. Longley; Sgt. G. O'Keefe; Flt. Sgt. J. T. Taylor; Flt. Sgt. R. Tranmer; Flt. Sgt. G. Twyneham.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. C. G. Cairns, D.F.M.; Sgt. R. H. Easton; Sgt. L. D. Hammond; Sgt. W. Lawson; Sgt. H. Martin; Flt. Sgt. J. P. R. Mount.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. A. 'Ackland; F/O. K. L. Agnew; Sgt. E. H. Alcock; F/O. D. MacK. Bell; Sgt. D. H. Betts; Sgt. D. G. G. Buckle; P/O. R. J. Butler; Sgt. K. R. Carter; Sgt. B. Clark; F/O. D. W. Cobbin; Sgt. K. S. Crinfield, P/O. S. D. Cunningham; Sgt. I. Davies; F/O. T. Docherty; Sgt. L. H. Doe; F/O. A. W. Douglas; P/O. G. Fielding; F/O. A. Fletcher; P/O. L. F. Gill; Flt. Lt. S. A. H. Glasspool; F/O. W. C. Grimes, D.F.M.; Act. Sqn. Ldr. O. V. Hanbury, D.S.O., D.F.C.; F/O. C. K. Hanscomb; Flt. Lt. T. W. R. Healy; Flt. Sgt. C. A. James; Sgt. C. F. Kirsch; Sgt. C. Langley; P/O. F. Langley; Flt. Sgt. E. W. Lawrence; F/O. C. S. Laxton; Sgt. R. W. Longley; Flt. Sgt. W. Lumsden, D.F.M.; P/O. A. L. MacKenzie; Flt. Sgt. G. Marlow, D.F.M.; F/O. G. W. Marshall; P/O. L. H. Matthews; Sgt. D. R. Mills; Sgt. E. Mortimer; Flt. Sgt. J. Murray; Sgt. J. W. Neeve; F/O. J. Nelson; Act. Sqn. Ldr. E. H. M. Nesbitt; P/O. P. E. Newland; Flt. Sgt. B. H. Papworth; Act. Flt. Lt. J. Perfect; Flt. Sgt. K. A. Porteous; Flt. Sgt. J. N. Redfern; Sgt. A. Reeves; Sgt. A. A. M. Seaman; Sgt. F. J. Seeley; Flt. Lt. A. Seymour; Flt. Sgt. H. Smith; Flt. Lt. D. Smyth, D.F.C.; Sgt. T. C. Soloman; Sgt. K. F. Stanbridge; Flt. Lt. C. R. Stannard; Sgt. F. O. Stoney; Sgt. A. B. Summers; Flt. Sgt. F. E. Summers; Sgt. G. H. C. Wade; Sgt. A. Watson; Sgt. J. C. Webber; P/O. S. J. Whittingham, D.F.M.; F/O. H. J. Whitticks; Sgt. W. F. A. Whittock; Sgt. R. Willis; Act. Flt. Sgt. W. M. Wilson; Act. Flt. Lt. E. E. G. Youseman, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. R. E. Blair.

WOUNDED OR INJURED IN ACTION.—F/O. L. N. B. Cann; F/O. H. G. Silcock; F/O. G. A. Thorne.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. M. H. Broden; Sgt. P. J. Brown; Sgt. A. R. Burley; Flt. Sgt. T. L. Jones; F/O. J. D. Mackie; Sgt. T. J. Minns; F/O. E. W. Sawyer; Sgt. J. Sullivan.

MISSING.—Sgt. J. W. Allison; Flt. Lt. J. N. Andrews; Sgt. J. W. Barnden; Flt. Lt. R. D. Bell; Sgt. W. J. Bingham; Flt. Sgt. D. S. Black; Sgt. J. Boyle; P/O. R. Bradford; F/O. A. G. Brandon; Flt. Lt. A. R. Brown; Sgt. R. E. T. Burns; Flt. Lt. J. C. Chesters, D.F.M.; Sgt. O. F. Cleminson; F/O. C. T. Collyer; Sgt. H. G. Copper; Sgt. J. Cottam; Sgt. W. Freeman; Flt. Lt. G. U. Fulford; Flt. Sgt. D. Gardner; Sgt. J. Gartland; P/O. J. R. Gillespie; Sgt. W. B. Gillingham; Sgt. L. Hales; W/O. D. G. Hardy; Sgt. F. J. H. Harris; Sgt. J. J. Harris; Wing Cdr. G. E. Harrison, D.F.C.; F/O. J. S. Henderson; F/O. F. Hill; Sgt. D. A. Hinchcliffe; Flt. Sgt. C. H. Houghton; Sgt. D. M. Hughes; W/O. J. C. Jones; Sgt. J. R. Jones; Sgt. W. F. W. Jones; P/O. H. J. Keenan; F/O. A. J. Kendall; Flt. Sgt. J. Kilpatrick; Sgt. E. P. Knight; Sgt. A. W. Levick; Flt. Sgt. A. M. Lewington; Sgt. F. Longbottom; F/O. N. Mackay; Flt. Sgt. T. R. Maravan-Williams; Sgt. W. H. H. Matthews; Sgt. E. Meering; Sgt. C. E. Miller; Sgt. K. J. Mizon; F/O. M. J. S. Mohr; Flt. Lt. K. A. W. Morris; F/O. F. J. Mortimore; Act. Sqn. Ldr. S. R. Muller-Rowland, D.F.C.; F/O. R. A. Nicholls; Flt. Sgt. J. S. Noble; Flt. Lt. A. E. Palmer; P/O. G. A. Payne; Flt. Sgt. R. Percy; Sgt. W. Pollitt; Sgt. L. A. Pople; Sgt. H. R. Porter; Sgt. F. Reed; W/O. L. G. Remblance; Sgt. G. Sharrocks; F/O. R. W. Shepherd; Sgt. W. Skea; Flt. Lt. N. E. Skinner, D.F.C.; Flt. Lt. D. A. Smart; Flt. Sgt. E. P. A. Standfield; W/O. G. D. Taylor, D.F.M.; Sgt. L. G. Thompson; F/O. H. A. Thornington; Sgt. J. P. Van der Linde; Sgt. R. Williams; Sgt. E. J. Wright; Sgt. S. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. F. B. Law; A/C.1 J. R. Swann; Flt. Sgt. E. A. Walker; W/O. W. H. Watts.

KILLED ON ACTIVE SERVICE.—Cpl. L. G. Atkins; L.A/C. A. R. Beal; L.A/C. R. L. A. Brown; Sgt. H. C. Chaffey; Wing Cdr. C. F. M. Chapman; L.A/C. F. H. Clarke; Wing Cdr. R. B. Cox; Sgt. G. Crozier; Sgt. J. Dare; Sgt. S. F. Davies; L.A/C. E. Ellison; Flt. Sgt. R. W. Field; W/O. T. P. G. Griffin; L.A/C. J. C. Griffiths; Sgt. D. Hannan; F/O. S. A. Hill; Flt. Sgt. A. S. Kay; P/O. W. S. Knowles; Cpl. F. N. Matthews; L.A/C. T. R. Pickering; Flt. Sgt. G. Pigott; Flt. Lt. P. H. W. Priestley; L.A/C. D. R. Saunders; Sgt. M. Silver; Sgt. C. W. R. Small; Sgt. H. Stephenson; Sgt. A. S. Titchener; Sgt. A. F. West; L.A/C. N. Worton

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. K. Dunkerley.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. F. W. R. Baker; F/O. J. D. Chapman; L.A/C. G. H. Dean; L.A/C. P. Harper; L.A/C. H. E. Maskill; L.A/C. J. H. Maxwell; L.A/C. R. Murphy; L.A/C. A. T. Raymen; Cpl. P. Redd; L.A/C. J. Semple; A/C.1 R. H. Shannon; Act. Sqn. Ldr. J. T. Shaw, D.S.O., D.F.C.; Cpl. K. R. Trigg.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. R. McQ. Henderson.

DIED ON ACTIVE SERVICE.—Act. Cpl. D. R. Adams; F/O. D. H. Apperson; L.A/C. R. Coe; L.A/C. F. J. Griffin; L.A/C. C. Henry; Flt. Lt. R. J. Mackay; L.A/C. J. P. Mairs; L.A/C. L. A. Mitchell; A/C.1 W. T. Moore; L.A/C. V. Newland; A/C.1 F. J. Parker; F/O. R. K. Pile; L.A/C. E. B. Richards; Sgt. E. C. Riches; L.A/C. D. H. Robb; Act. Sqn. Ldr. R. J. Steer; L.A/C. R. Torrance.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. H. W. Bradbury; Flt. Sgt. K. Dobbs; Flt. Sgt. R. G. Hollis; Flt. Sgt. E. L. Humes; Flt. Sgt. H. M. McAllister; Flt. Lt. J. R. Normandale; Flt. Sgt. H. C. Petty.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. R. T. P. Savage.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. W. K. Hutton; Flt. Sgt. C. H. A. Smith; F/O. R. E. Walker.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. D. Anderson; F/O. B. A. Bunning; Sgt. H. Coldham-Fussell; F/O. J. B. Gleeson; Sgt. P. L. Johnson; Flt. Sgt. H. J. Krohn; Flt. Lt. H. J. Lees; Sgt. B. D. M. McDonnel; Sgt. W. H. Powis; Flt. Sgt. J. R. Speirs; Act. Sgt. B. E. Stehr.

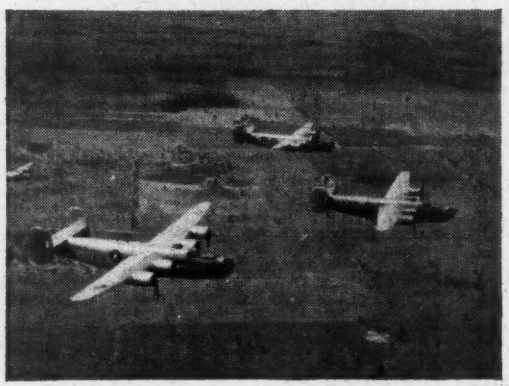
WOUNDED OR INJURED IN ACTION.—W/O. K. A. Davies; Flt. Lt. J. L. Lowther.

MISSING, BELIEVED KILLED IN ACTION.—F/O. C. E. Cock; W/O. R. Faria; W/O. A. R. Lyneham.

MISSING.—P/O. D. R. Abell; W/O. P. H. Brewin; P/O. J. C. Cottier; W/O. P. R. Criddle; F/O. A. F. Cunningham; P/O. J. M. Felgate; P/O. W. W. Furse; Act. Flt. Lt. H. M. Godsall; F/O. D. J. Jennings; Act. F/O. J. H. Middleton; P/O. A. J. Perkins; P/O. R. F. Philp; Flt. Sgt. G. L. Toose; P/O. S. J. Trimble; F/O. H. H. Turnbull; F/O. E. B. Willis.

KILLED ON ACTIVE SERVICE.—P/O. L. H. Biesiot.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. J. H. Gillespie.



NOT NASSAU : Liberators of a R.A.A.F. O.T.U. on a cross-country exercise over Australia.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. G. E. Henry; P/O. K. B. Ketcheson; F/O. M. J. Laderoute; P/O. J. C. Lees; Flt. Sgt. O. McMillan; P/O. M. S. R. Mahon; F/O. J. C. Morgan.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. J. E. Dulude; W/O. C. J. MacDonald.

MISSING, BELIEVED KILLED IN ACTION.—F/O. T. Frederickson; P/O. W. A. Gray; Sgt. V. A. McPhee; P/O. I. T. Pelechaty; P/O. G. E. Ryan.

MISSING.—F/O. O. H. Antoft; Flt. Lt. B. Boe; Flt. Lt. J. W. Cowling; P/O. J. F. De Cordoue; P/O. J. W. Erickson; P/O. R. B. Herger; F/O. J. K. MacDonnell; Flt. Lt. E. H. Treleaven; F/O. R. W. Vokey; W/O. L. I. Whitlock; F/O. J. G. Wills.

KILLED ON ACTIVE SERVICE.—F/O. W. D. D. Cooper; Flt. Lt. J. W. Mathers, D.F.C.; Sgt. W. R. Mattless.

DIED ON ACTIVE SERVICE.—Sgt. B. W. Secker; Sgt. C. W. Tricker.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. M. A. Sullivan, D.F.C.

WOUNDED OR INJURED IN ACTION.—W/O. W. D. Longhurst.

MISSING.—W/O. T. B. Brierley; W/O. D. M. Mathewson; W/O. S. C. Shutt.

South African Air Force

MISSING.—Lt. R. E. Deppe; 2/Lt. A. C. Greefe; L.A. Sgt. E. Gtcoavinga; W/O. C. Leynhans; 2/Lt. L. A. Verity.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—2/Lt. C. C. Geldard.

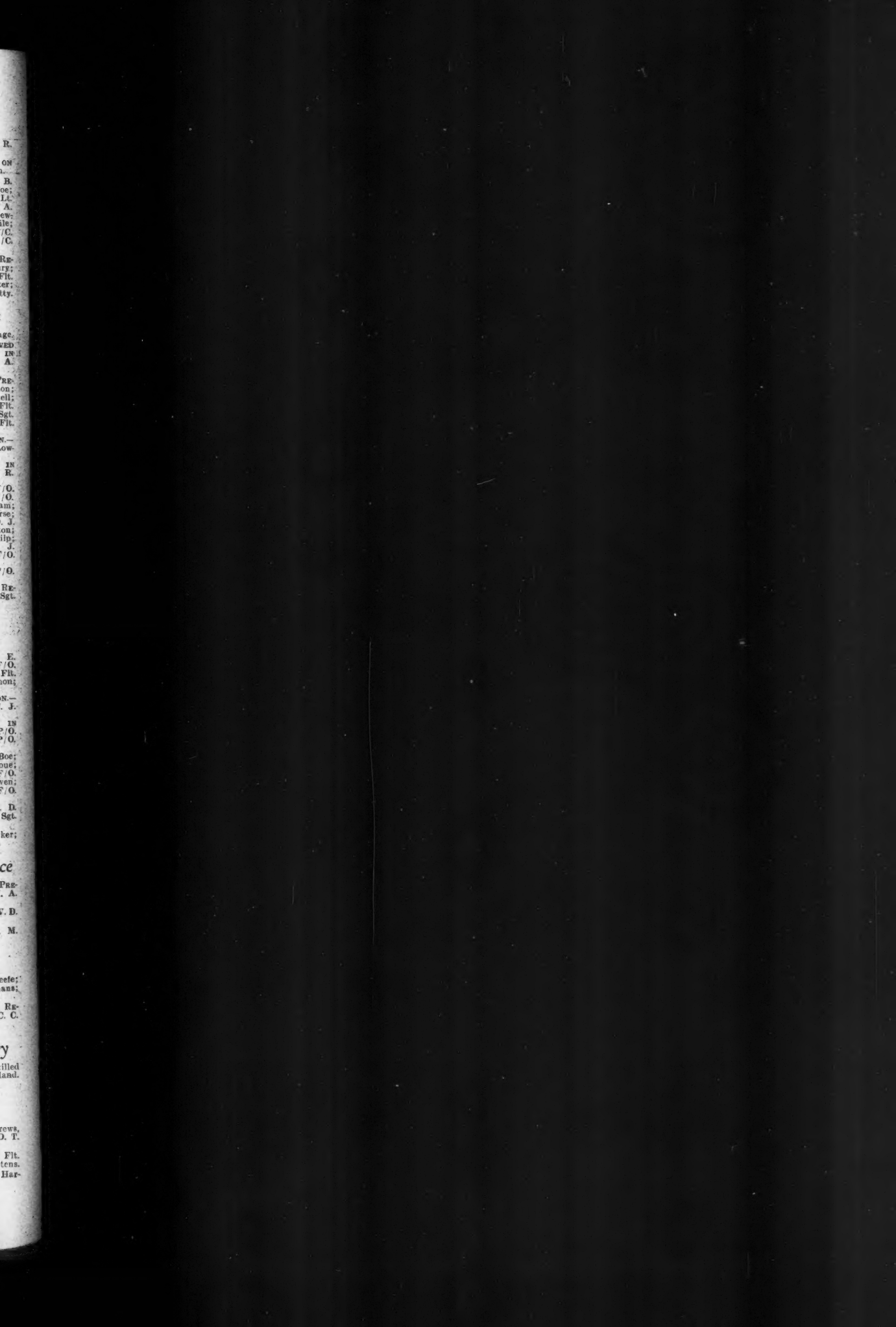
Air Transport Auxiliary

First Officer Roderick Williams, A.T.A., killed whilst ferrying His Majesty's aircraft in England.

Official Corrections

Casualty Communiqué No. 468.

Under "MISSING" delete Flt. Sgt. F. Andrews, F/O. K. J. Ayres, Sgt. E. Mullan, Flt. Sgt. D. T. Stevens.

R.C.A.F.—Under "KILLED IN ACTION" for Flt. Sgt. W. R. Karstens read P/O. W. R. Karstens.

Under "MISSING" for Flt. Sgt. T. A. Harrington read P/O. T. A. Harrington.